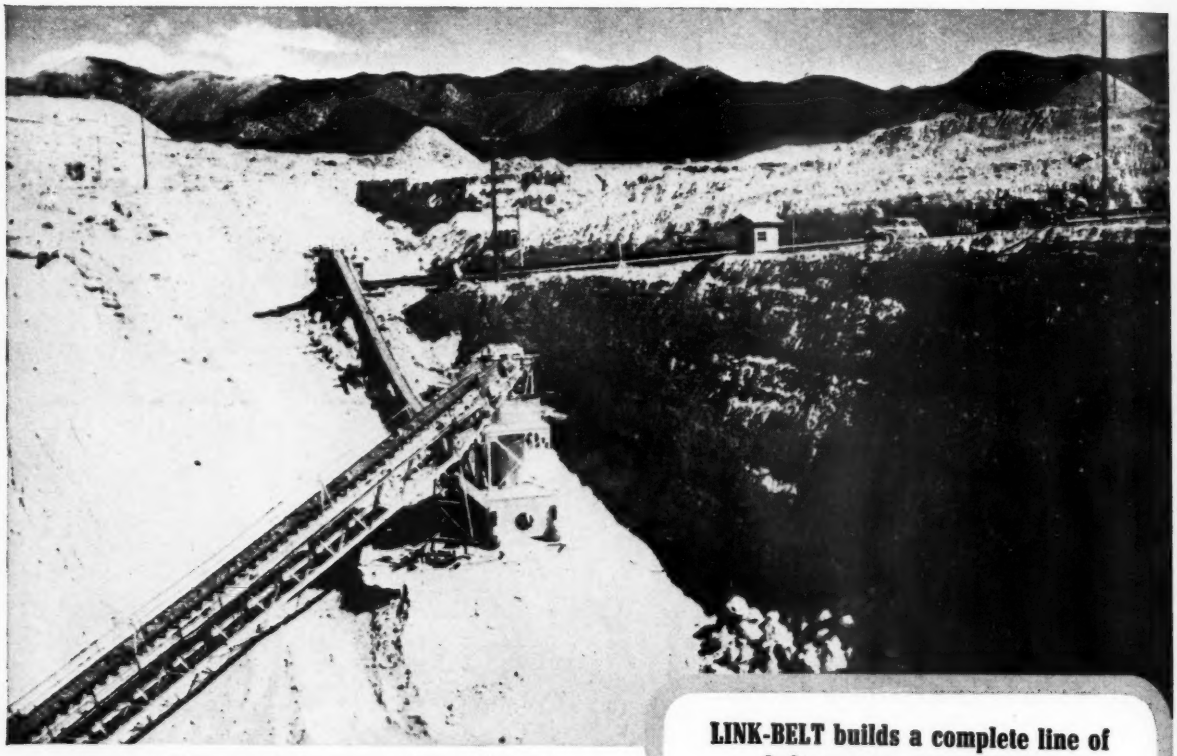
Mining CONGRESS JOURNAL

AMERICAN MINING CONGRESS

JUNE 1953

COAL SHOW REPORT NUMBER

TOTAL ENGINEERING



Porphyry gold ore, crushed enroute, is elevated from pit floor to storage area by series of Link-Belt belt conveyors.

It's your assurance of top efficiency with LINK-BELT belt conveyors

HERE'S how "total engineering" works for you when you use Link-Belt Belt Conveyors. First, Link-Belt conveyor engineers analyze your needs—then recommend the *right* components. In addition, Link-Belt can supply all related equipment — other types of conveyors, feeders, elevators, car dumpers and shakers. And Link-Belt will build your supporting structures and enclosures . . . install the job completely, if desired. Call the Link-Belt office near you for any engineering assistance you need.

LINK-BELT

BELT CONVEYOR EQUIPMENT

13,280-D

LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Colmar, Pa., Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle, Toronto, Springs (South Africa), Sydney (Australia). Sales offices in Principal Cities.

LINK-BELT builds a complete line of belt conveyor components

ALL TYPES OF ROLLER BEARING IDLERS

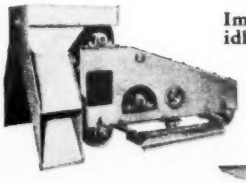
Return idler

20° troughed idler

Belt-training idler

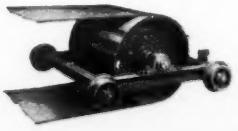
Rubber tread return idler

Impact-cushioning idler



BELT AND MOTOR PROPELLED TRIPPERS

COMPLETE TERMINAL MACHINERY



at Mines #3 and #8 Penna. Coal & Coke Co.

Continuous Miners are used throughout these mines — and tough Kennametal U4H Bits do all the cutting. Mine officials installed them 100% after trying all available makes of carbide bits. Kennametal delivered the lowest bit cost on record: $.0110 per ton — 65% less than any other carbide bit!

Remember that ability to cut more coal is not the only reason Kennametal is used by cost-conscious mines. Savings in power output, reduced costs for resharpening and reconditioning, more efficient functioning of machines and men are all possible through proper use of Kennametal Bits. Together, they can bring about a lower cost per ton that could be important to you, in *your* mine.

Kennametal Bits consistently produce new records in cost reduction because (1) their hard Kennametal tips have shock-and wear-resistant qualities superior to any other tungsten-carbide in the industry and (2) they are sold by veteran mining men who gladly go into the mine to demonstrate the right bit for the job. Get in touch with your Kennametal Representative today!

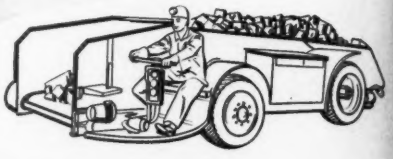
KENNAMETAL®
KENNAMETAL INC., MINING TOOL DIVISION
BEDFORD, PA.
General Offices and Main Plant at Latrobe, Pa.

World's Largest Manufacturer of Tungsten-Carbide
Drill Bits, Cutter Bits, Roof Bits, Rock Bits, Strip Bits

The NEW T-H Exide-Ironclad

★ 20% more capacity in the same space

★ Lowest cost per A.H. to own and operate



Heavier demands on all types of battery-powered haulage equipment dictate the need for batteries with greater capacity.

The new Exide-Ironclad T-H battery gives 20% more capacity in the same space—WITHOUT SACRIFICE OF LONG LIFE for which Exide-Ironclad Batteries are famous.

This new T-H battery is of the time-tested Exide-Ironclad construction, employing the exclusive slotted tube positive plate. New materials have made structural changes possible, which permit the use of larger positive plates—resulting in increased capacity.

The T-H line of Exide-Ironclad Batteries includes capacities for all battery-powered haulage units.

Now—more than ever before...
YOUR BEST POWER BUY
AT ANY PRICE!

Thrifty Hauler

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 2
Exide Batteries of Canada, Limited, Toronto

1888—DEPENDABLE BATTERIES FOR 65 YEARS—1953

"EXIDE", "EXIDE-IRONCLAD", "SILVIUM", "PORMAX", *Reg. T.M. U.S. Pat. Off.*

Battery

THESE FEATURES CONTRIBUTE TO THE HIGHER CAPACITY AND LONGER LIFE OF THE T-H BATTERY

LARGER POSITIVE PLATES
of exclusive Exide-Ironclad slotted tube construction.

POSITIVE PLATE SPINES
cast with the heavy top cross bars, are of SILVIUM, which resists corrosion — contributing to longer battery life.

SLOTTED PLASTIC TUBES
of non-oxidizing polyethylene—retain active material in contact with spines, yet permit the electrolyte to penetrate throughout the active material.

POLYETHYLENE TUBE SEALER
This acid-proof plastic sealer fits snugly into the bottom of positive plate tubes, sealing in the active material for a longer working life.

EXTRA HEAVY NEGATIVE PLATES
to balance the new positive plates.

PORMAX SEPARATORS
Practically indestructible. Decrease internal resistance, thus assuring quick starting and rapid acceleration, plus lower operating costs.

CORROSION-RESISTANT TRAY GUARD
A plastic, acid-resistant steel tray coating, with high insulating qualities and the ability to withstand hard knocks.

NEW QUARTER TURN PLASTIC VENT PLUGS
Made of unbreakable polyethylene. Can be quickly and easily removed to add water.

HOMOGENEOUS SEALING COMPOUND
resists shock, without cracking, at high or low temperatures. Forms a permanent seal between jar and cover.

MOLDED SEAMLESS SHOCK-PROOF JAR
High quality rubber. Sturdy . . . built for a long life of heavy duty service.

Left: Standard Coring Bit, for best results in hard, firm, rock.
Center: Impregnated Coring Bit, for best results in broken or extremely abrasive rock.
Right: Series "M" Coring Bit, for maximum core recovery from coal or fragile rock.

for Faster Drilling and Better Cores at Lowest Cost Per Foot

TAILOR-MADE DIAMOND BITS

To secure best-possible all-round results in diamond core drilling, the bits used must embody the correct combination of design, matrix, size and grade of diamonds, for the particular type of formation encountered. The wide variety of standardized combinations illustrated and described in our new Bit Bulletin enables purchasers to make a satisfactory selection in most cases, but we welcome opportunities to develop special bits to meet unusual conditions or requirements. Write for Bulletin 320 and tell us about your operating conditions.

HIGH-SPEED DRILLING MACHINES

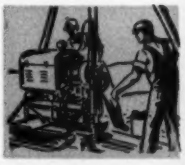
Our wide line of high-speed diamond drilling machines meets every requirement for both core drilling and blast-hole drilling at minimum expense—measured by the results achieved. Modern design, rugged construction, anti-friction bearings and heat-treated alloy-steel wearing parts permit long periods of continuous high-speed operation under the most difficult conditions. Illustrated bulletins, containing complete specifications and working data, mailed on request.

COMPLETE ACCESSORY EQUIPMENT

To meet the requirements of our own contract drilling crews, we are obliged to supply a wide variety of accessory equipment and to carry all commonly-used items in stock for immediate delivery. The same prompt service is available to other diamond drill operators and ordering is made easy by a 28-page catalog which gives all necessary information—including illustrations, piece numbers, weights and code numbers, for ordering by wire or cable. Every operator of a diamond drilling rig should have a copy of Bulletin 31-F and we'll send one free of charge.

WORLD-WIDE CONTRACT DRILLING

For more than sixty years, Sprague & Henwood, Inc. has been a leader in the field of diamond core drilling by contract. During this long period, our crews have completed thousands of contracts successfully, in practically every corner of the globe. Besides exploratory drilling for coal and ore, our service includes foundation-test drilling, grout holes and pressure grouting. Correspondence is invited regarding any diamond drilling job—anywhere. Estimates on request.



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Contents

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Member Audit Bureau of Circulation.

THESE REPOINTERS ARE *wear-conditioned*

*U. S. Pat. No. 2, 247, 202

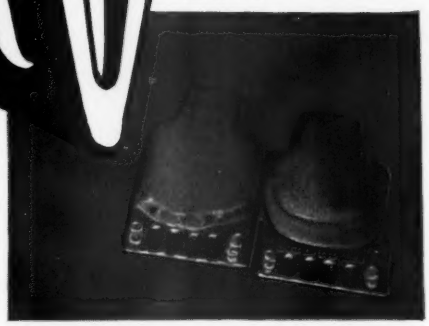
Because they are AMSCO "Wear-Sharp"* Repointers that stay sharper with use...

Service life plus! The combination of Amsco Manganese Steel and the hardness of AMSCOATING with Amsco Hardfacing electrodes—gives you a tooth that wears evenly and stays sharp longer.

Note that only certain grooves (shown in red at left) are Amscoated—the grooves on the outside and the one on each end. This is the area where ordinary teeth wear fastest. The hardened corners on the "Wear-Sharp" equalize wear along the entire cutting edge and eliminate rounded, blunted corners that cut digging speed and waste power.

Field reports indicate that "Wear-Sharp" repointers will give as high as six times the life of other teeth.

In these photographs at right of a typical case history, old repointers lasted from three to four days. Amsco "Wear-Sharp" repointers lasted 32 days—eight times the service life of the repointers previously used.



"Wear-Sharp" repointers installed on two dipper teeth showing condition of old teeth.

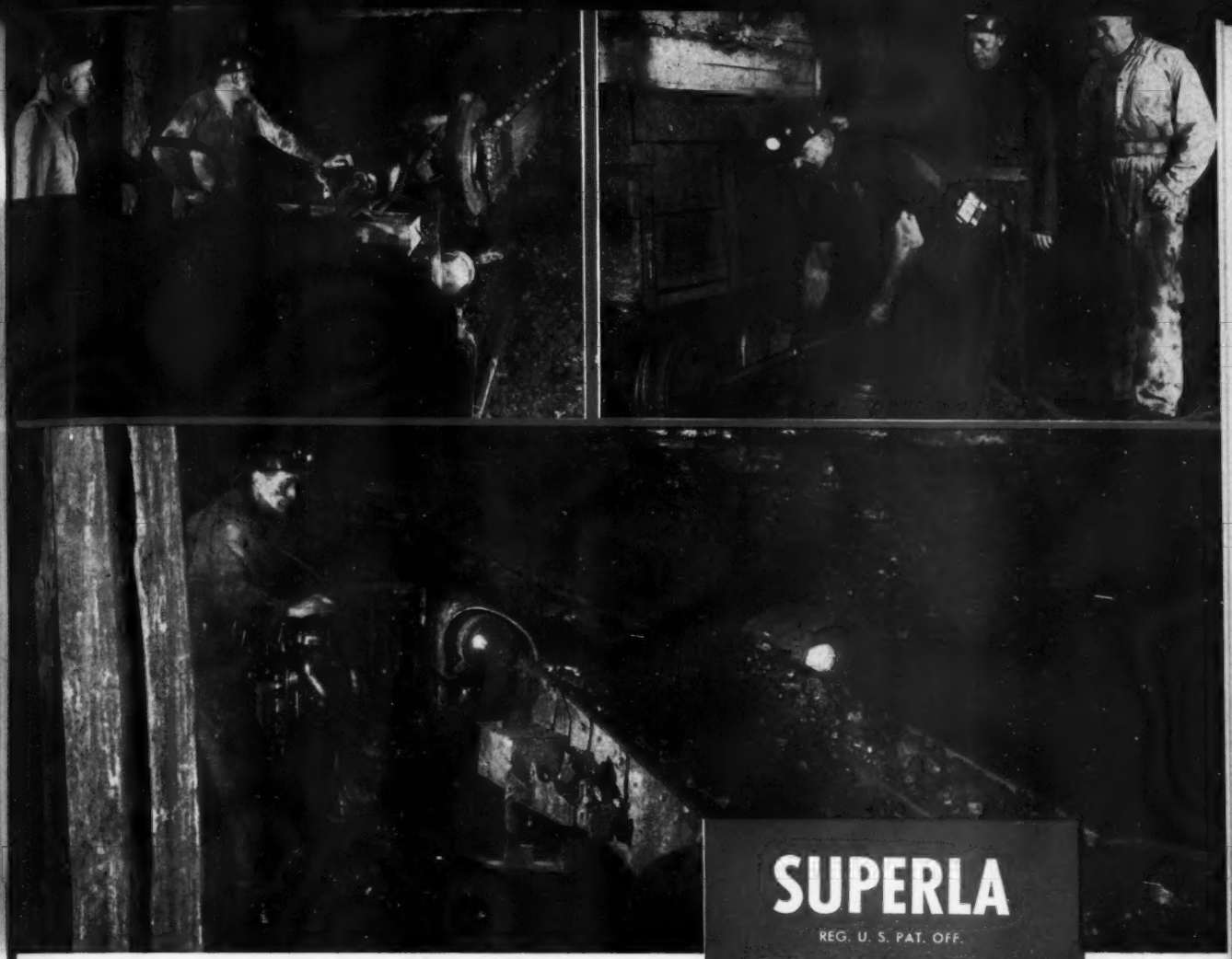
Notice the even wear on these teeth after 257 hours of use with "Wear-Sharp" repointers used. New "Wear-Sharps" are ready for installation.

AMERICAN Brake Shoe COMPANY

AMERICAN MANGANESE STEEL DIVISION

422 EAST 14th STREET · CHICAGO HEIGHTS, ILL.

Other Plants: New Castle, Del., Denver, Oakland, Cal., Los Angeles, St. Louis. In Canada: Joliette Steel Division, Joliette, Que. Amsco Welding Products distributed in Canada by Canadian Liquid Air Co., Ltd.



SUPERLA
REG. U. S. PAT. OFF.
Mine Lubricants

One for all...

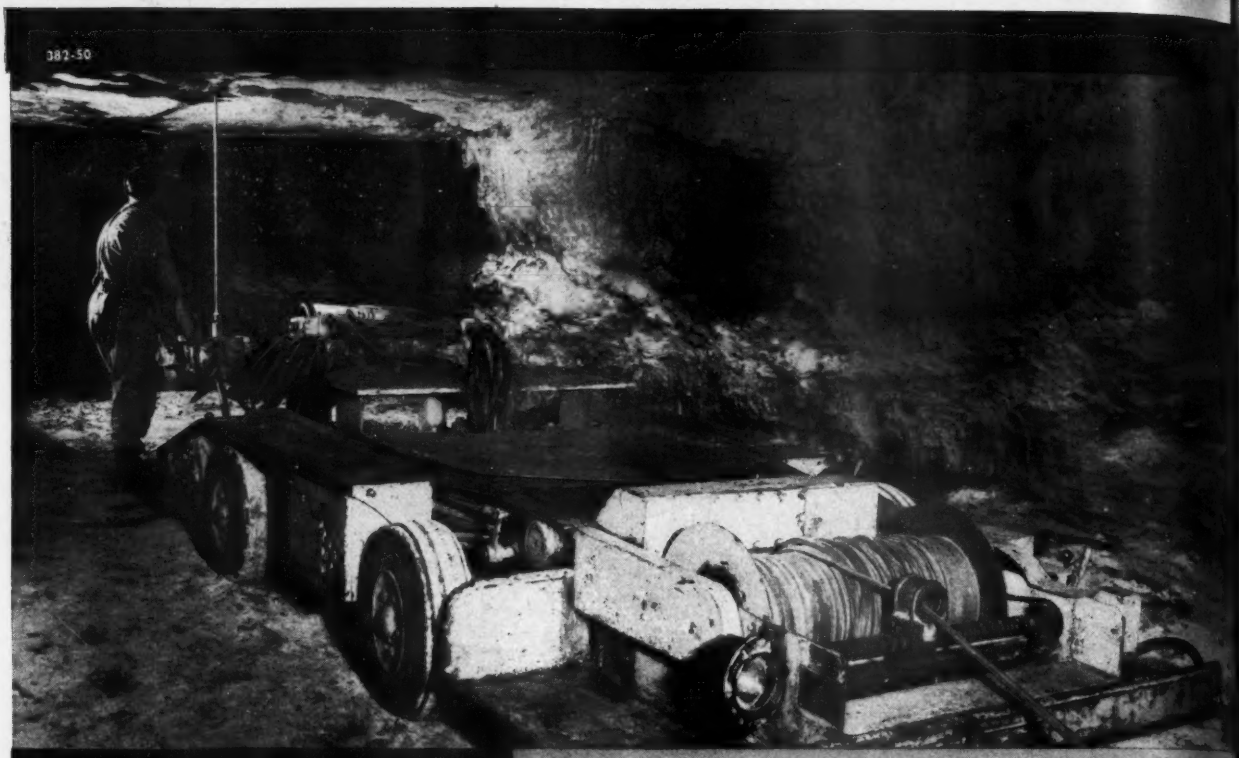
More and more midwest mines are realizing important savings through the versatility of SUPERLA Mine Lubricants. Inventories have been simplified and over-all lubrication costs reduced.

In one mine, a SUPERLA Mine Lubricant was adopted for use in main transmissions and gathering heads of Joy loaders and in the wheel bearings of coal cars as well. In over three years' operation, there has been no downtime because of scored clutch plates or faulty lubrication. In the cars, leakage of lubricant from bearing housings has been eliminated.

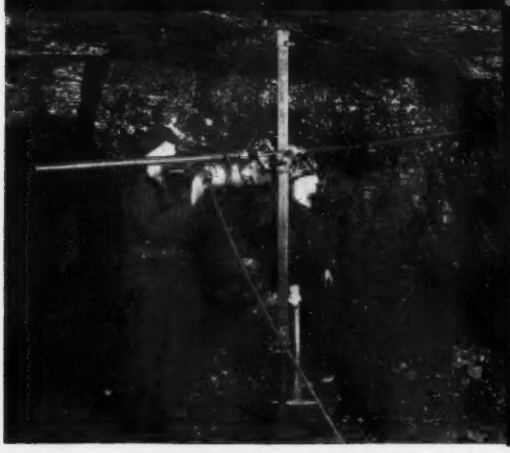
Also in this mine, a SUPERLA Mine Lubricant has provided trouble-free lubrication in the transmissions of Goodman loaders and in the gear cases of cutting machines. In more than three years of operation, there have been no cases of downtime of loaders or cutters due to faulty lubrication. Warm-up time for the loaders has been eliminated.

These are the big jobs, but the versatility of SUPERLA Mine Lubricants covers a wide range of applications from motor armature bearings to loading machine hydraulics. The chances are you can replace several special-purpose lubricants with one or two SUPERLA Mine Lubricants and get better lubrication results in each case. There's a Standard Oil lubrication specialist located near you who knows mining equipment and who will work closely with you. To reach him, you need only call your local Standard Oil office, or write: Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY STANDARD *(Indiana)*



JEFFREY DRILLS COVER EVERY MINING NEED



1 Jeffrey Roof Drilling Machine at work with auger in socket and drilling a roof hole. Water is introduced at drill chuck . . . is carried through drill rod to drill bit in the hole. This eliminates dust while drilling.

2 Jeffrey A-7 Hand-Held Drill.

3 Jeffrey A-6 Post Drill, a popular and widely used unit.

THE ACCOMPANYING ILLUSTRATIONS show various types of Drills produced by Jeffrey to meet the widely different conditions encountered throughout the coal mining industry.

Directly above is the Jeffrey 56-FHR Drilling Machine. Tramming is accomplished by two hydraulic motors and cable reel is also hydraulically operated. The Jeffrey 74-BR., a heavy duty machine, is furnished with either one or two drilling arms. Other models, track-mounted units, are available.

One of the latest additions to the broad Jeffrey line is the Roof Drilling unit shown at the top of opposite page. It not only drills roof holes but provides a torque wrench for anchoring and tightening roof bolts. Straight-line feed for the auger and parallelism to its starting position are maintained by means of cams which shorten and lengthen the Drill Arm and make the required angular adjustments as the drill is fed upward.

Other drilling units are shown also. With this wide range of drilling equipment it is easy to select the right one for the job at hand. Let a Jeffrey engineer help you.

BEHIND THIS DOOR lies the secret . . .

of why your Heyl & Patterson Heavy Bulk Materials Handling Installation will last . . . and last . . . and last

Since 1887 Heyl & Patterson has designed, fabricated and erected well over 3000 Heavy Bulk Materials Handling installations of all types . . . from coal tipples to complete coal preparation plants . . . from pig casting machines to mammoth ore bridges.

Today the great majority of these installations are still in operation, including many that were built 50 to 65 years ago.

The H & P Service Department is an important factor in the consistent long life of all Heyl & Patterson installations.

Night or day, the Heyl & Patterson Service Department is prepared to go all out to supply H & P customers with replacement and spare parts in the shortest possible time.

This on-the-spot service is facilitated by Heyl & Patterson's system of recording all detailed drawings on 70 mm microfilm, which is available at a moment's notice.

Time and time again the H & P Service Department has done the "next to impossible" to keep H & P installations in operation. Letters of thanks from customers prove this to be the rule rather than the exception.

The operations of the H & P Service Department in working with the customer after a contract is completed is another example of the "follow-through" that your business receives at Heyl & Patterson . . . the "follow-through" that is possible because we have our own Engineering Department, our own Research Department, our own Machine Shop, our own Structural Shop, our own Erection Department and our own SERVICE DEPARTMENT.

All H & P departments work together to provide you with the world's finest Heavy Bulk Materials Handling Equipment.

Heyl + Patterson, Inc.

"SINCE 1887"

55 WATER STREET · PITTSBURGH 22, PA

Heavy Bulk Materials Handling Equipment

All The Way from Design to Erection

GARDNER-DENVER
is first again!

now it's the "Blast Hole" drill designed especially for percussion deep hole drilling

the NEW Model SFH99

A Natural Partner — with Carbide Bits and Superior Gardner-Denver Alloy Sectional Rods and Couplings — for Low Cost Blast Hole Drilling.

Permits a 4' change in a 7' drift—saves time and development work.

Superior chuck construction—1½" x 3 13/16" shank rod locked in chuck—results in longer life for hammer, tube, chuck, shank rod and ring seal.

Locked-in shank rod prevents loss of rod string on down holes.

Heavy-duty centralizer supports rod string during rod changes—simplifies up-hole drilling.

Reverse rotation and locked-in shank rod enable operator to uncouple rods quickly and easily—using power from the drill and only one wrench.

Delivers high-pressure water or air through chromium plated tube and Ring Seal Shank.

Lightweight aluminum alloy guide shell—reversible for extra life. Movable cone.

Write today for complete details.

SINCE 1859

GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd.,
14 Curity Avenue, Toronto 13, Ontario

THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS
FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

HAZACORD BULLETIN

HAZARD INSULATED WIRE WORKS • DIVISION OF THE OKONITE COMPANY, WILKES-BARRE, PA.

NEW SHUTTLE-CAR CABLE CONSTRUCTION PUTS "HEX" ON STRAIN..INTERNAL ROTATION..FATIGUE

New, Improved Grounding Conductor Gives HEX-TITE Added Flexibility

Hazacord HEX-TITE Type G, provides extra workability and flexibility in grounded cables. The grounding conductor is composed of many more fine wires protected by a cotton serving that forms a smooth channel through which the ground wire can work.

Special Lubricated Strand

Hazard's processing of the grounding strand permits the conductor to work freely without wear or danger of breakage of the strands. This added workability of the grounding conductor permits sharp bending of the cable without fatigue.

HEX-TITE Conductors Provide Exceptional Heat Resistance

Hazard Performite Heat-Resisting Insulation is used in all HEX-TITE Cable. It is suitable for operating temperatures as high as 75C. It provides a safety margin of about 25% to withstand overload surges.

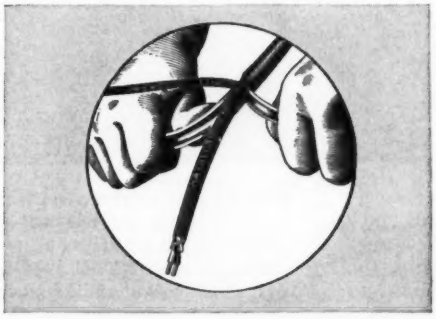
New Hazacord HEX-TITE Twin Shuttle-Car Cable Promises Longer Lived, Lower Cost Trailing Cable Operation

Resisting internal twisting and slippage, new Hazacord HEX-TITE Twin Cable sets a new standard for trailing cable. Hexagonal insulated conductors provide six plane surfaces to form an extra strong mechanical bond with the protective Hazaprene ZBF Sheath. An open reinforcing braid over the hex-insulation is an additional guard against excessive pulling and dislocation.

Special Adhesive Bond

Hex-insulation in the new Hazacord HEX-TITE is treated with a strong adhesive bonding agent for further resistance to slippage within the sheath. Yet, this adhesive permits removal of the sheath for splicing and repair without tearing or damage to the conductor.

Hazard representatives throughout the mining areas have complete information on new HEX-TITE Twin Shuttle-Car Cable. You can also write Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pennsylvania.



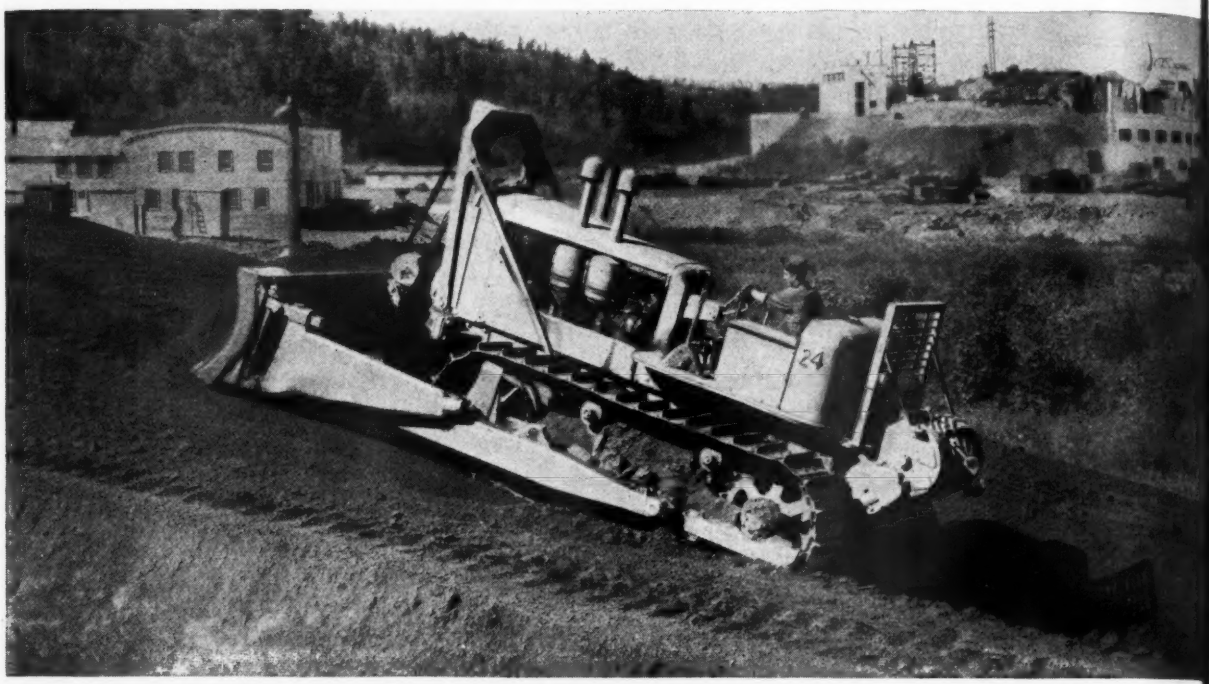
Tough, Hazaprene ZBF Sheath First with Mine Operators

For real protection, new Hazacord HEX-TITE has the famous Hazaprene ZBF Sheath. It offers superior resistance to flame, oil, acid and mechanical damage. And this sheath is pressure-vulcanized in a continuous metal mold for a smooth, dense surface that resists abrasion and tearing. Proof of mold curing is the full description and official approval number P-104BM embossed in raised letters in the sheath.

Prevents Shorting

The rugged Hazaprene Sheath completely encases each hex-conductor, providing a barrier between power conductors and between power and grounding conductor on Type G. This protective wall prevents shorting when the cable is run over and compressed.

NEW TRENDS IN MINING MECHANIZATION



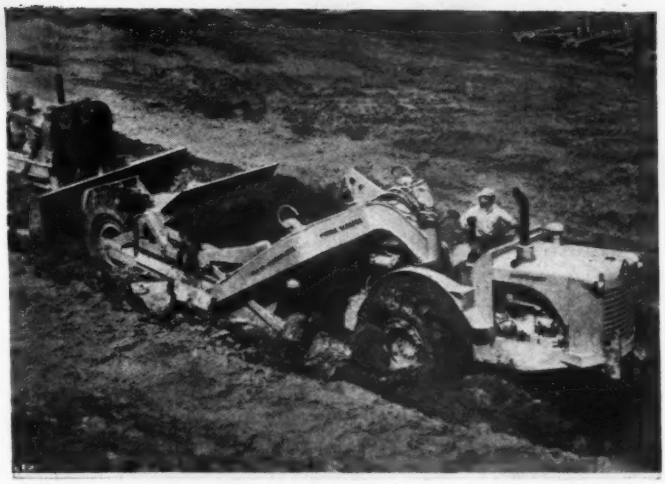
Stockpiles processed ore. HD-20 Tractor also builds access roads . . . maintains tailings dumps . . . cleans up around shovels . . . cuts drainage ditches . . . digs sludge basins and sluice-ways . . . builds reservoirs and pond dams . . . clears and levels building sites . . . tows equipment.

Loads ore underground. HD-5G Tractor Shovel also loads sand and gravel, other bulk materials . . . cleans up around conveyors and hoppers. Special materials buckets, bulldozer blades, other attachments available. Tractor shovels available for all sizes of Allis-Chalmers crawler tractors.

Builds and maintains haul roads. AD-40 Motor Grader levels pit bottoms . . . digs and grades for drainage . . . scarifies . . . prepares dragline sites. Gasoline-powered Model D Grader also available. Handles routine road maintenance — light construction, etc.

TODAY'S demands on mining production require the selection of equipment of the broadest versatility. Allis-Chalmers offers a complete range of material moving and handling equipment — including four sizes of diesel crawler tractors, motor graders, pull scrapers, high-speed Motor Scrapers and Motor Wagons — designed to fit your particular mining applications and to deliver the highest possible output.

Here are some on-the-job views with a few of the many ways in which these modern machines are speeding production and lowering costs.



Strips overburden. 13-yard heaped capacity TS-200 Motor Scraper also loads, hauls material from open pit . . . clears and levels for camp sites and drill setups . . . levels and grades building sites . . . hauls in supplies. Larger 18-yard heaped capacity TS-300 also available.

Hauls rock overburden. TR-200 Motor Wagon hauls tailings, sand, gravel, silicon, lead and zinc ore. Unit travels fast "off-road" with capacity loads . . . dumps clean every time with 18-ton, hydraulic-controlled rear-dump body. Sides channel-ribbed for rigidity.

Levels tailings dump. HD-20 Tractor with pull-type scraper also loads and hauls ore-bearing material — handles large-scale stripping jobs. Exclusive Allis-Chalmers hydraulic torque converter on HD-20 gives higher output, less upkeep on pulling, pushing and dozing work.

Complete line of pull-type scrapers available, from 2-yard to 18-yard sizes.

Your Allis-Chalmers dealer will be glad to analyze your equipment needs and help you select the right machines for your jobs. See or phone him soon to watch these machines in action.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

Design Features

1 End-seating valve is fast and positive in action. It meters the air efficiently — keeps air consumption down, provides powerful force of blow and strong rotation. Performance of valve is not affected by wear.

2 Positive lubrication system distributes oil throughout the machine and insures long life for all moving parts. Rifle bar is oiled at every stroke of piston. This prolongs the life of rifle nut and rifle bar at least 50%.

3 All Le Roi-CLEVELAND Sinkers are famous for strong, positive rotation. That's why they are at their best when the drilling's the toughest. Properly designed rotation parts—ratchet, pawls, rifle bar and rifle nut—plus efficient lubrication of these parts, give you this important drilling advantage.

4 Exhaust ports are large — they avoid freezing.

5 Plenty of hole-cleaning power is provided in all Le Roi-CLEVELAND Sinkers, so that you can get the most out of their powerful force of blow and strong rotation. Bit wear is reduced and drilling speeds are faster.

6 Floating-type chuck permits slight misalignment without binding piston. This reduces piston scoring, adds to life of the machine.

7 Throttle valve is designed to stay in any desired operating position from full-on to blowing. All parts are fully enclosed, protected from dirt, and generously lubricated.

Here's the "inside story"

of why Le Roi-CLEVELAND Sinkers drill more footage per shift, stay underground longer

THERE are things you *can't see*, behind Le Roi-CLEVELAND dependability—"hidden values," design details. But you know *they're there*—because that's why Le Roi-CLEVELAND Sinkers drill more feet of hole per shift . . . why they run at peak efficiency day in and day out . . . why they lower drilling costs on any job that requires a hand-held drill.

It's Le Roi-CLEVELAND *engineering* that gives you performance advantages that really pay off for you: Low air consumption. Easy handling. Strong rotation. High drilling speed.

Le Roi-CLEVELAND has a complete line of sinkers from 18 to 80 lbs. Your Le Roi representative can show you why you're money ahead with any one of them. See him soon.

Write for free Bulletin No. RD25.

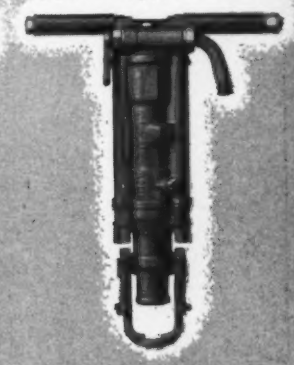
CLEVELAND ROCK DRILL DIVISION
Le Roi Company
12500 BEREA ROAD • CLEVELAND 11, OHIO
Plants: Milwaukee, Cleveland and Greenwich, Ohio

H23 — 83-pound sinker Dry and wet types. 1"x4¼" hex or quarter-octagon. 1¼" or 1⅛" lug shank. Designed for shaft sinking in hard rock or bad, faulting ground . . . general drilling with heavy steel in hard rock.

H10 — 45-pound sinker Dry, constant blowing, and wet types. ⅞" x 3¼" and 1" x 4¼" hex or quarter-octagon chucks. Wet automatic dust-control back-head, if desired.

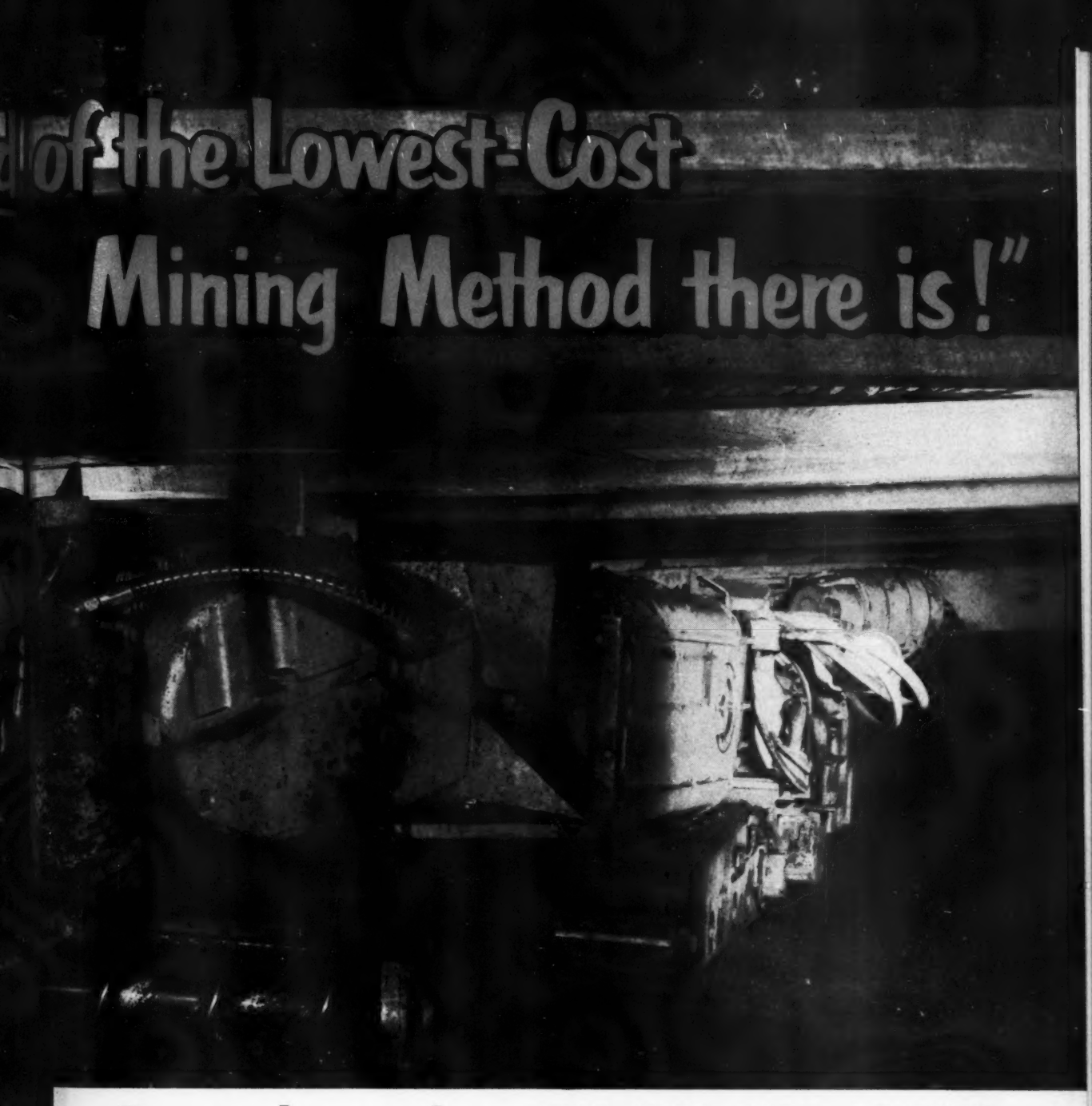
H166 — 33-pound sinker Wet and dry types. ⅞" x 3¼" chuck. Recommended for hard coal. Also ideal for wet or dry drilling in shale, limestone, sandstone, etc.

H22 — 18-pound sinker Wet and dry types. ⅞" x 3¼" chuck. Recommended for: Drilling holes for trolley hanger bolts. Cleaning up roof. Clearing out rock falls. Brushing bottom. Drilling oversize pieces at grizzley. Cutting hitches.



H111 — 55-pound sinker Dry, constant blowing, and wet types. 1" x 4¼" chuck (⅞" x 3¼" and popular sizes of quarter-octagon and lugged steel chucks also available.) Wet automatic dust-control back-head, if desired. Primarily designed for hard rock, but equally efficient in soft and medium formations.

Air-feed mountings up to 10' steel changes.



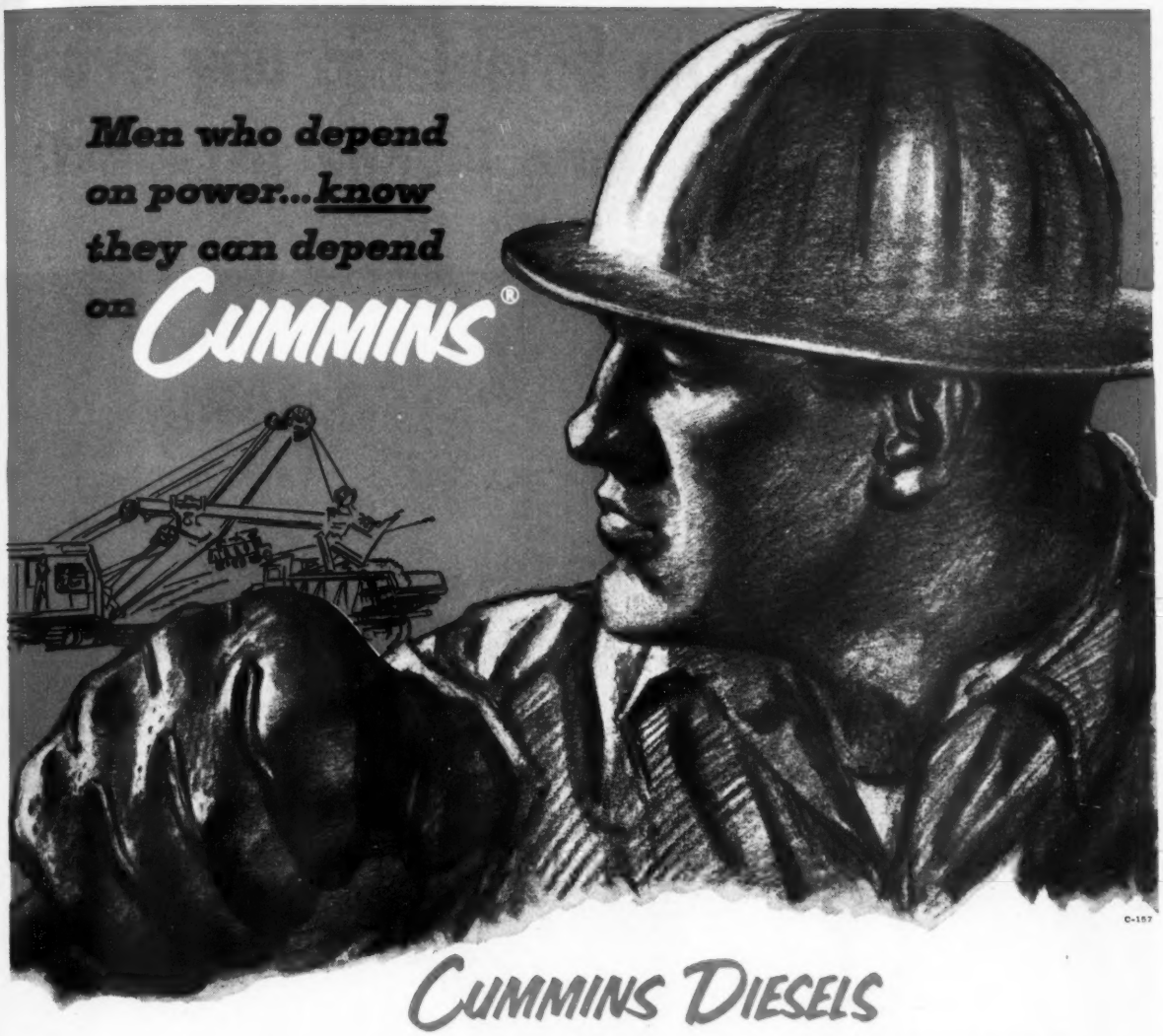
Depend on the CONTINUOUS MINER

- Low coal, thick seams or split seams . . . it makes no difference what your mining conditions are, there is a field-proved JCM machine built to suit them. *More than 200 in service or on order!*
- The Continuous Miner does everything you ask of it . . . develops entries, opens headings, drives up rooms, takes pillars.
- Gives you maximum recovery . . . over 80% total recovery is common, and some cases actually exceed 90%.
- Gives you favorable size consist and high production rates, at absolute rock-bottom cost per ton mined. Let us show you complete facts and figures.

Address ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

JOY

WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING EQUIPMENT



CUMMINS DIESELS

are engineered to make light work of tough jobs

Write for

FREE

informative booklet

"The Dependable Diesel"

demonstrating Cummins' performance in all power jobs.

You know it pays to hire the most experienced worker. In the field of rugged, lightweight, high-speed diesels, Cummins has logged more *pioneering* time than any other engine maker.

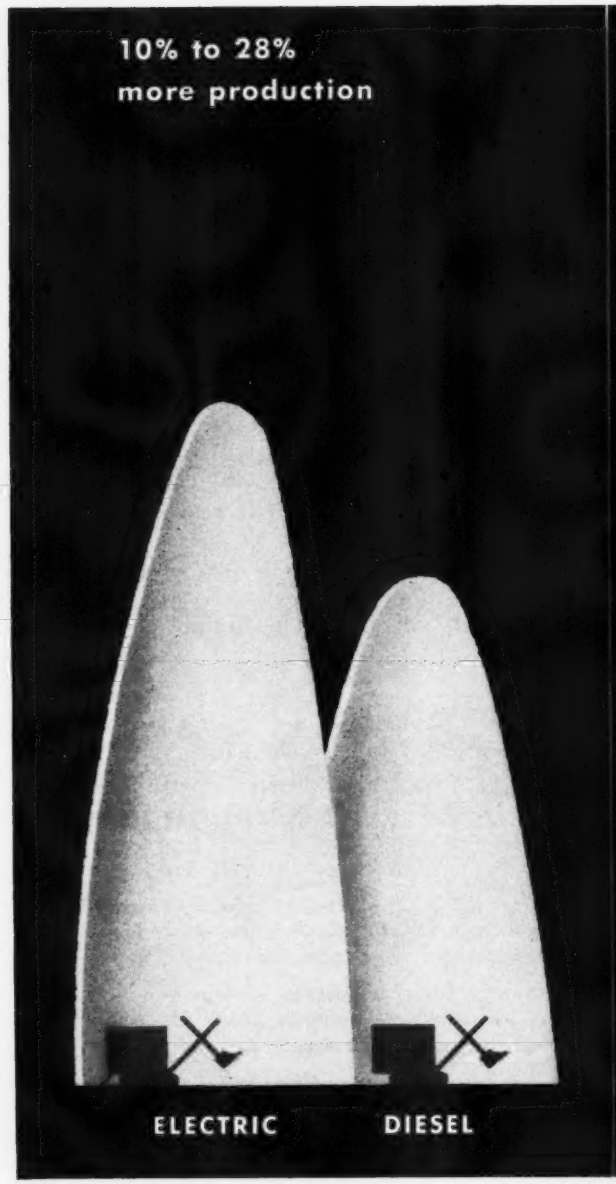
Yes, Cummins ranks as the leader in boosting diesel power, flexibility and stamina . . . reducing dead weight and bulk. The result: engines that are *tough* yet *mobile!* The story of the modern lightweight, high-speed diesel is the story of Cummins. Today, as in the past, Cummins sets the pace . . . works continuously to produce diesel engines that get more work done at lower cost, that outperform all others on every job.

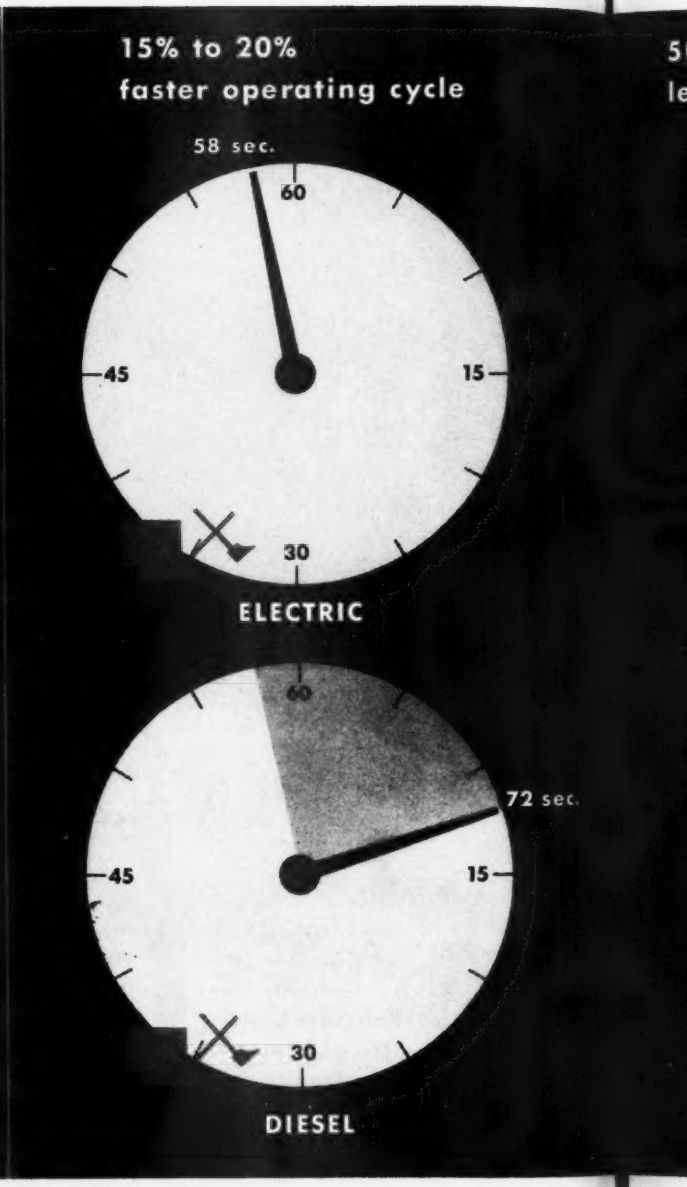
Find out what a Cummins Diesel (60-600 h.p.) can do in your operations. Your Cummins dealer is ready to give you *all the facts.* Call him today.

***Leaders** in rugged, lightweight high-speed diesel power!*

CUMMINS

CUMMINS ENGINE COMPANY, INC.
Columbus, Indiana
Export: Cummins Diesel Export Corporation
Columbus, Indiana, U.S.A. Cable: CUMDIEX

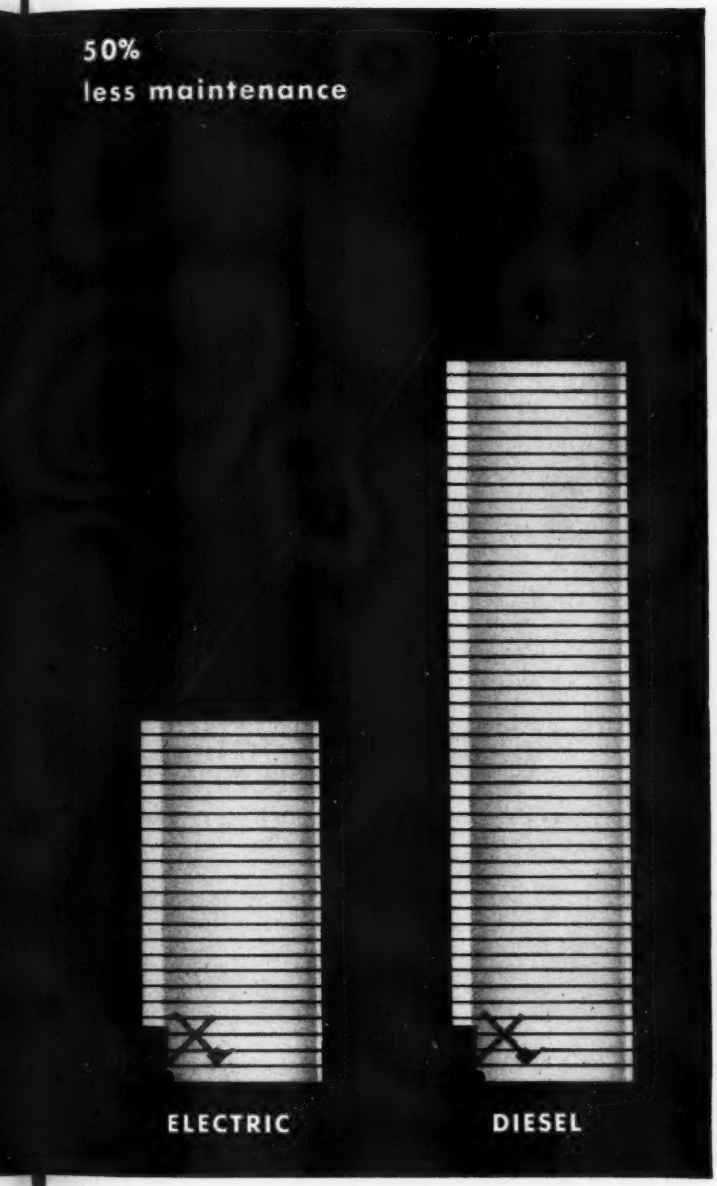




10% to 28% more production—One shovel manufacturer studied both electric and diesel powered, 13 cubic yard units working under equal conditions. Results showed that the all-electric shovel was about 28% more productive. It's been proved that all-electric shovels and draglines will outproduce any other type by at least 10% in any size range from 2½ cubic yards up.

15% to 20% faster operating cycle—One reason for such fast performance is that all-electric units, unencumbered by mechanical brakes and slipping clutches, have an infinitely faster transmission of power. Precise speed and power control make it possible to design electric machines for much higher operating speeds than all other types of shovels and draglines.

Have you considered all the advantages of electric shovel operations?



50% less maintenance—One large shovel manufacturer has estimated that your maintenance of power equipment alone would be approximately 50% less if you switch to an electric shovel or dragline operation. Your savings in maintenance would amount to about $150 to $175 per month, based upon a 40-hour week, single-shift operation with a medium-sized machine.

Two leading shovel manufacturers, who build both electric and diesel powered units, say you can't beat electric drives for shovel performance. They agree that all-electric (Ward-Leonard type) shovels and draglines, such as Westinghouse-equipped machines, are the most productive types for any operation. These figures show why!

All-electric shovels and draglines give you:

10% to 28% more production
15% to 20% faster operating cycle
50% less maintenance

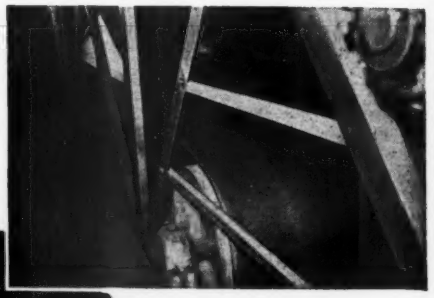
What about initial costs? All-electric shovels and draglines have a higher initial cost in smaller sizes, but actually cost less in the larger machines. However, even in the smaller sizes, the productive life of an all-electric shovel or dragline is roughly *double* that of comparable engine-driven unit.

Save money . . . Call Westinghouse before you buy!

If you're considering a new shovel or dragline, call your Westinghouse representative before you buy. He'll show you how Westinghouse-equipped shovels and draglines can give you these and other dollar-saving benefits. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-94995

YOU CAN BE SURE...IF IT'S
Westinghouse

How does U. S. Rubber's twisted belt handle wet ore?



BELT BEING TWISTED as it leaves vertical gravity take-up before running over return idlers.

(right) GENERAL VIEW of belt carrying iron ore from crushers to stock pile. (Mather Mine, "B" Shaft of the Negaunee Mine Co., operated by the Cleveland Cliffs Iron Co., at Negaunee, Mich.)

RETURN STRAND of belt being twisted before reaching tail pulleys.

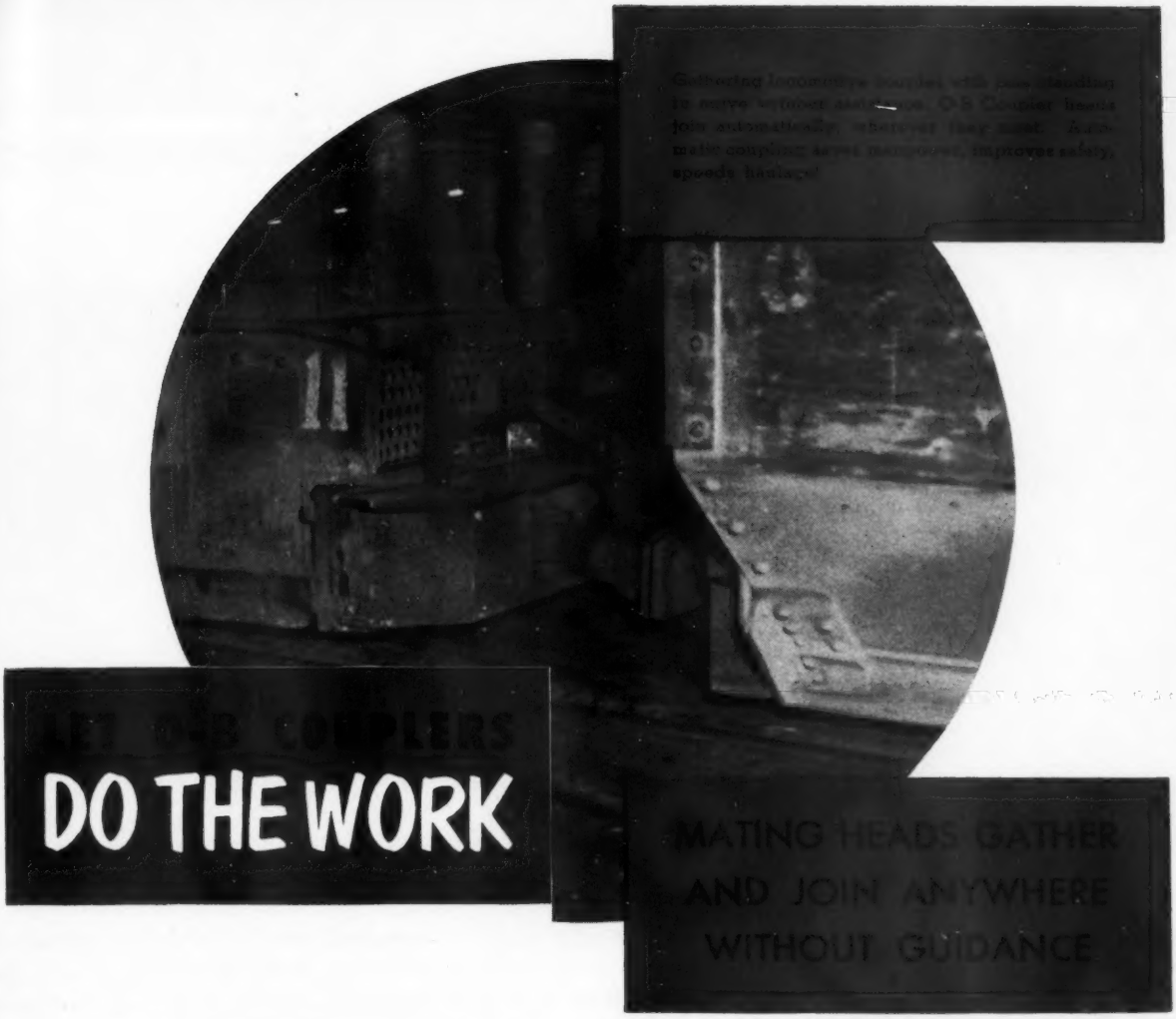
PRODUCT OF U.S.RUBBER SERVING THROUGH SCIENCE

This belt is twisted behind the head pulley to make the clean side of the belt run against the return idlers, preventing wet iron ore from building up on them. The belt is twisted again before it reaches the tail pulley, so that the load is placed on the carrying side of the belt. Installed at a mine in Michigan's Upper Peninsula, this U. S. Matchless belt is 1425 feet long, 36 inches wide. It is used to stockpile ore above ground.

United States Rubber Company engineers have the research facilities and the experience that enable them to build the right kind of belt for your needs. They are specialists in reducing haulage costs and raising output. Write to address below.

UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.



"Join Anywhere" ability in O-B Automatic Mine Car Couplers gives any haulage operation increased safety and speed. Cars equipped with O-B couplers join and automatically couple under any normal haulage condition. Extra-wide gathering range of these couplers permits mating heads to guide one another together wherever cars meet - in curves, dips, or knuckles.

Horizontal gathering range for O-B couplers is 15 inches, or 7½ inches to either side of the coupler centerline. In dips or knuckles, cars may be displaced as much as 14 degrees (and this can be increased to 22 degrees). Even at these extremes O-B couplers meet and join readily.

Increased safety results from O-B coupling, for there's no need for a man to enter the between-cars danger zone. Speed comes with O-B coupling, too. Cars join when they meet, saving the time it would otherwise take to make a coupling by hand.

Couplers with "Join Anywhere" ability keep workmen out of a danger spot; speed haulage movement. Those are pretty good reasons for choosing O-B for your new or remodeled cars!

Ohio Brass

MANSFIELD OHIO, U.S.A.

4354-AM

"Eucs" haul big loads

at less cost

Write for your free copy of the new book "Estimating Production and Costs of Material Movement with Euclids"... it contains helpful information for all users of off-the-highway hauling equipment.

More loads per hour and more profit per load with Euclid equipment on the job . . . that's the experience of many quarry operators, open pit mines, sand and gravel producers, and industrial users of heavy duty off-the-highway hauling units. "Eucs" consistently increase production and reduce the costs per ton or yard of material moved.

Bottom-Dump Euclids are engineered and built as complete units with weight distribution that provides better flotation and traction. With payload capacities up to 40 tons and powered by diesel engines of 190 to 300 h.p., these "Eucs" have loaded top speeds up to 34 m.p.h.

Rear-Dump "Eucs" are job proved for economical hauling of aggregate, rock, overburden and other heavy excavation. Powered by diesel engines of 125 to 400 h.p., they carry payloads of 10 to 40 tons at speeds up to 36 m.p.h.

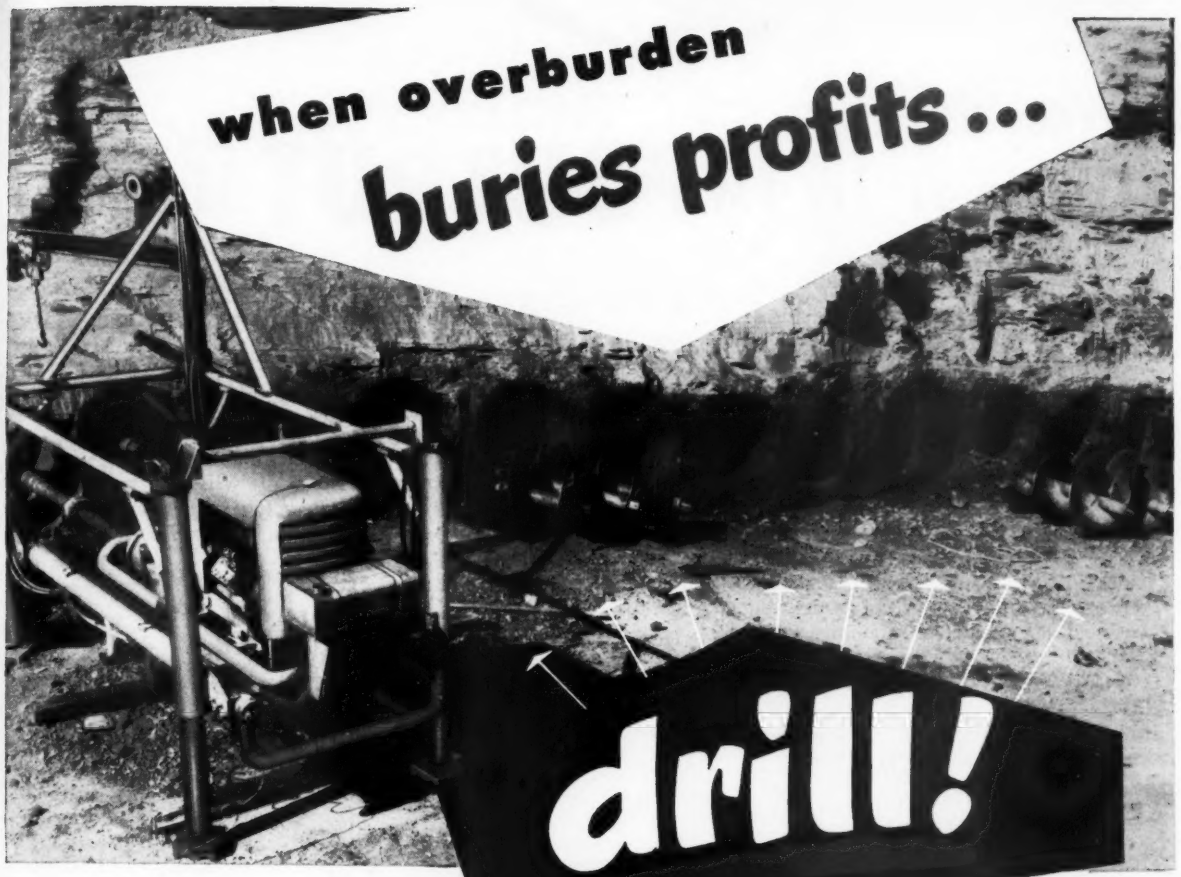
Owners everywhere report longer service life, greater job availability and more production at less cost with Euclids. See your Euclid Distributor for a detailed job study and Euclid cost estimate for your hauling operation.

The EUCLID ROAD MACHINERY Co., CLEVELAND 17, OHIO

EUCLID "THE PIONEER"

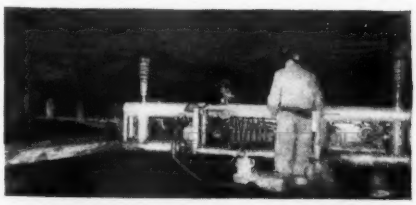
Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE



CARDOX Surface AUGER MINER

brings "dead" strip mines back to life . . .



CARDOX Underground AugerMiner
The practical answer for mines where seams or poor roof conditions make conventional mining unprofitable or unsafe. Write for Bulletin.

With a CARDOX Surface AugerMiner you can drill back 10 to 120 feet into coal seams buried by excessive overburden. The cost of salvaging this coal is normally only a fraction of that of the original working by conventional methods. The coal you left behind may be your highest profit tonnage!

CARDOX AugerMiners can be trucked or towed on their detachable wheels to any exposed face of coal. They are self-positioning to the height of the seam. Driven by a rugged 145 H.P. engine, augers up to 36 inches in diameter drill out clean, pure coal, ready for mechanical loading into trucks. Six-foot auger-sections are easily added or removed by the built-in retriever. Directional control keeps the auger boring into the best part of the seam, away from rock and shale.

Ask your CARDOX Representative for the Auger-Miner profit story. Or write for our AugerMiner bulletin.

CARDOX CORPORATION • BELL BUILDING • CHICAGO 1, ILLINOIS

WAREHOUSES

Harper, West Virginia
Phone: Beckley 4812

307 Northwest Fifth St.
Evansville, Indiana
Phone: Evansville 2-8944

Benton, Illinois
Phone: Benton 625

Box 427
Library, Pennsylvania
Phone: Library, Colonial 3-6910

Camden-on-Gauley, W. Va.
Phone: Camden-on-Gauley 2181
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St. Clairsville, Ohio
Phone: St. Clairsville 619

Louisville, Colorado
Phone: Louisville 234

Route 2, Box 99
Pikeville, Kentucky
Phone: Robinson Creek 5

Ottumwa, Iowa
Phone: Ottumwa 51

another slugger in the OUTPUT lineup

Now — taking its place in the outstanding line of Bucyrus-Erie heavy-duty quarry and mine excavators is the field-proved 4½-yard 110-B — a convertible shovel-dragline which can give you bigger output in loading or stripping at lower cost than any other machine of like capacity on the market today

Like the larger 150-B (6-yard) and 190-B (8-yard) machines, the 110-B features Bucyrus-Erie's exclusive shovel front end. The strong, light two-section boom reduces weight and speeds digging cycle, yet provides ample strength for tough digging. Tubular dipper handle, free to rotate in saddle block, permits digging with one corner of dipper without introducing torsional strains. Powerful effective rope crowd reduces swing inertia because crowd machinery is located on revolving frame. And, twin-dual hoist ropes concentrate power where needed to pull dipper through toughest banks.

Before you buy any machine in the 4½-yard range, investigate the 110-B. It will give you consistently large ouput at lowest cost per yard. For detailed information, write today for Bulletin 110-B-1.

5153C

BUCYRUS ERIE

SOUTH MILWAUKEE, WISCONSIN

NO WET CYCLONE WEAR PROBLEM HERE!

The DorrClone now equipped with Type CB Liner of Proven* Wear-Resistant Characteristics for Coal

The DorrClone . . . compact, high-efficiency deslimer . . . is now available with the special Type CB liner which solves the serious wear problem encountered in coal washing plant applications. This is but one result of a continuing Dorr program aimed at developing the best design and materials of construction for each DorrClone application.

Just how good is this liner? We'd suggest that you check for yourself. The results of its initial test at the Robena Mine are shown below.

Now . . . you can take full advantage of the remarkable economy and operating efficiencies of the DorrClone without concern over the wear factor. You can use it to recover your valuable fine coal fractions between 8 and 325 mesh at high density in a single stage. It will eliminate your high ash content slimes. And . . . as a Classifier ahead of a Dorr Thickener, it will help give you a completely closed water circuit.

For all the details, call for a Dorr engineer. He will gladly show you where it can be used in your flowsheet.

***Here are the facts . . .**

LOCATION: Robena Mine of United States Steel Corporation's Coal Division.

EQUIPMENT: 6" dia. DorrClone equipped with Type CB liner.

DURATION OF TEST: A total of 896 operating hours between February 3 and April 15, 1953, when the unit was taken off the line for exhibit at the Coal Show in Cleveland.

FEED TO DORRCLONE: Overflow from hydraulic classifier

Rate:	100 gpm
Screen Analysis:	20% + 35 mesh
	60% —325 mesh
Percent solids:	21
Percent ash:	17
Feed Inlet Pressure	40 psi (average)

WEAR RESULTS:

Wear in conical section: *negligible*
Wear at apex valve: *negligible*

DorrClone is a trademark of The Dorr Co., Reg. U.S. Pat. Off.

DORRCO

Better tools TODAY to meet tomorrow's demand

DORR

WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT

THE DORR COMPANY • ENGINEERS • STAMFORD, CONN.

Offices, Associated Companies or Representatives in principal cities of the world.

Decline Conveyor On the

HEWITT-ROBINS

EXECUTIVE OFFICES, STAMFORD, CONNECTICUT

Job for Over 24 Years

EQUIPMENT: Hewitt-Robins Decline Conveyor.

LOCATION: Reitz Coal Company, Mine #5, Windber, Pennsylvania.

MATERIAL HANDLED: 18" maximum size, r.o.m. lump coal.

PERFORMANCE: Probably the first declining belt conveyor to be placed in service, this unit was designed to handle bituminous coal at the rate of 100 T.P.H., down a decline of 112'-0", at a speed of 110' F.P.M.

RESULTS: Installed in 1925 this Hewitt-Robins belt conveyor provided over 24 years of dependable, trouble-free service. The original Hewitt-Robins belt did not need replacement until 1949; the original machinery is still in operation.

Engineering Data

LENGTH OF CONVEYOR: 710' center to center from end pullies.

WIDTH OF BELT: 36"

DECLINE OF CONVEYOR: 112' ... Belt Conveyor hugs the ground surface, in its travel.

CAPACITY: 145 T.P.H.

CHECK FOR INFORMATION ABOUT THESE JOB-TESTED PRODUCTS FOR YOUR OPERATION

CONVEYORS:
- ☐ —Belt
- ☐ —Dock
- ☐ —Mine
- ☐ —Shuttle
- ☐ —Slope
- ☐ —Vibrating
- ☐ —Fixed Tripper Shuttle

BELTING:
- *☐ —Elevator
- *☐ —General
- *☐ —Hot Materials
- *☐ —Raynile®
- *☐ —Steel Wrapper
- *☐ —Transmission
- ☐ —Woven Wire

☐ BUCKET ELEVATORS

☐ IDLERS

SCREEN CLOTH:
- ☐ —Electrically Heated
- ☐ —General

VIBRATING SCREENS:
- ☐ —Dewaterizers
- ☐ —General
- ☐ —Heavy-Duty Scalpers
- ☐ —Heavy Media

HOSE:
- *☐ —Acid
- *☐ —Air
- *☐ —Air Drill
- *☐ —Fire
- *☐ —Pinch Valve
- *☐ —Servall®
- *☐ —Steam
- *☐ —Twin-Weld®
- *☐ —Water
- *☐ —Water Suction
- *☐ —Flexible Rubber Pipe

☐ MECHANICAL FEEDERS
☐ STACKERS
☐ CAR SHAKEOUTS
☐ TRIPPERS
☐ BELT CLEANERS
*☐ GROOVED PULLEY LAGGING
☐ CRUSHERS
☐ PICKING TABLES
☐ LOADING BOOMS
☐ RUBBERLOKT® BRUSHES
☐ MOLDED RUBBER PRODUCTS
☐ DESIGN AND CONSTRUCTION OF COMPLETE MATERIALS HANDLING SYSTEMS

*For immediate information about these industrial rubber products, call your Hewitt Rubber Distributor (See "Rubber Products," Classified Phone Book.)

Hewitt-Robins Incorporated
666 Glenbrook Road
Stamford, Connecticut

NAME

TITLE & COMPANY

STREET ADDRESS

CITY PO ZONE STATE 1182

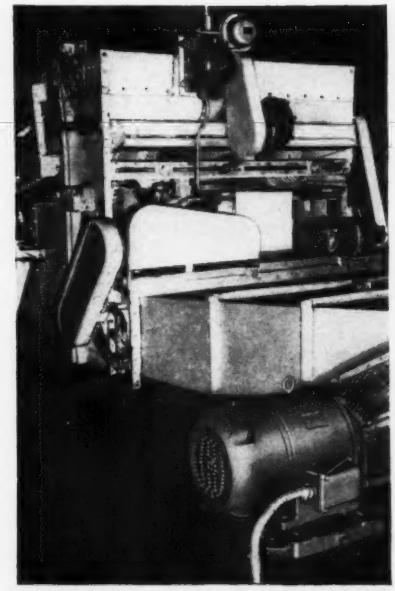
INCORPORATED

DOMESTIC DIVISIONS: Hewitt Rubber • Robins Conveyors • Robins Engineers • Restfoam
FOREIGN SUBSIDIARIES: Hewitt-Robins (Canada) Ltd., Montreal • Hewitt-Robins Internationale, Paris, France • Robins Conveyors (S. A.) Ltd., Johannesburg • EXPORT DEPARTMENT: New York City.

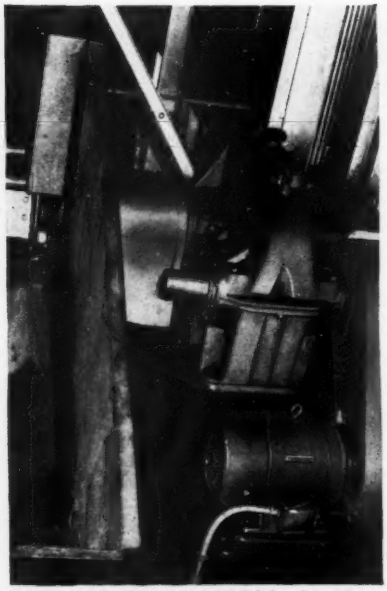
ENGINEERING REPORTS:

CENTRALIZED CONTROL of plant motors at Crown Mine's new preparation plant co-ordinates processing, saves steps, uses manpower most efficiently. This control desk, one of three in the plant, controls the operation of the loading booms.

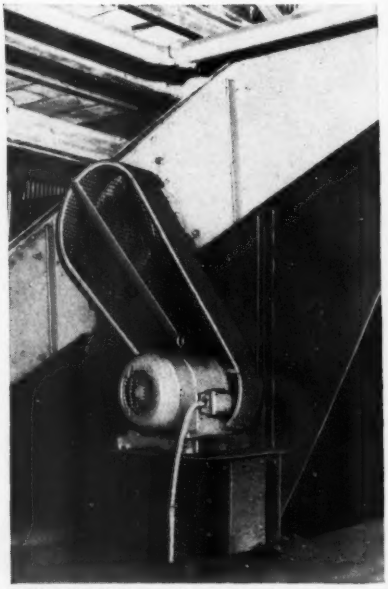
New coal plant cuts downtime



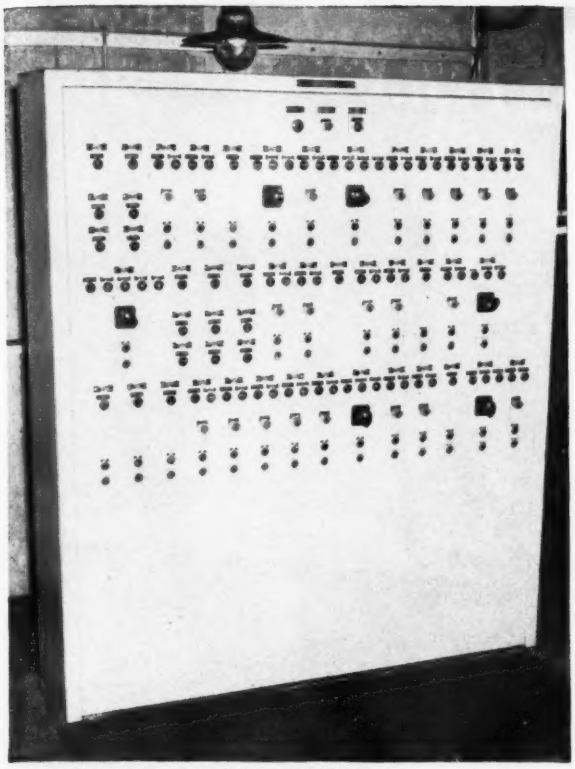
PROTECTED against coal dust, this G-E totally enclosed fan-cooled motor drives an air-flow cleaner in the prep plant.



MOST OF THE 146 MOTORS in this plant, like this one driving a crusher, are G-E totally enclosed fan-cooled motors.



DEPENDABLE service with only minimum maintenance is typical of G-E motors, like this one driving an ROM apron feeder.



CO-ORDINATED CONTROL SWITCHES are combined with indicating lights in this panel benchboard on the jig floor.

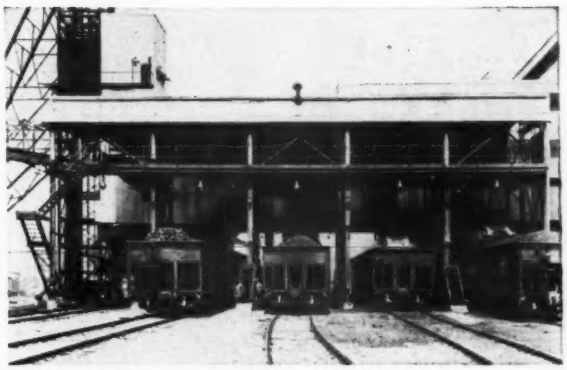
SEQUENCE OPERATION of plant motors is obtained through interlocks and timers in this G-E Cabinetrol assembly.

with co-ordinated G-E drives

Crown Mine uses G-E motors and control system-engineered to meet plant's needs

Freeman Coal Corporation's new Crown Mine preparation plant at Farmersville, Illinois, is a fine example of the way General Electric co-ordinates motors and control into a smooth-working system to maintain consistently high output at low cost. From self-dumping skips for ROM coal to automatic loading booms for clean coal, G-E system-engineered drives keep processing in step, minimize downtime, make most efficient use of manpower.

You, too, can profit by putting G-E engineering leadership to work on your preparation-plant problems. For more information, contact your local G-E Apparatus Sales Office, or write for Bulletin GEA-5308, "Electrified Coal Preparation," to General Electric Co., Section 663-31, Schenectady 5, N. Y.

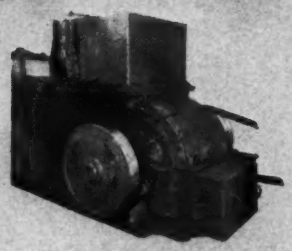


LOADING BOOMS discharging into railroad cars are controlled from boom operator's cab (upper left). Sequence control utilizing G-E Cabinetrol co-ordinates conveyor operation.

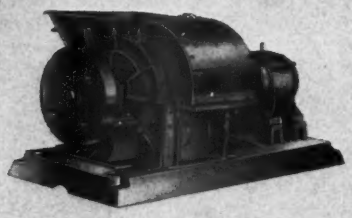
Engineered Electrical Systems for Coal Preparation Plants

GENERAL ELECTRIC

FOR HIGH TONNAGE CRUSHING . . .

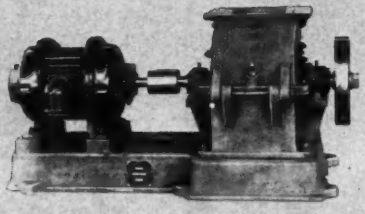


Heavy Duty 30-S. For Primary Crushing. Crushes ROM coal, rock, slate, sulphur balls and gob—high tonnage without oversize. Saves labor costs of pickers.

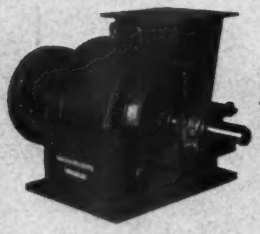


"S" Series. 9 sizes. Capacities up to 500 TPH. High tonnage with minimum fines. Well suited to power plants.

OR COAL SAMPLING . . .



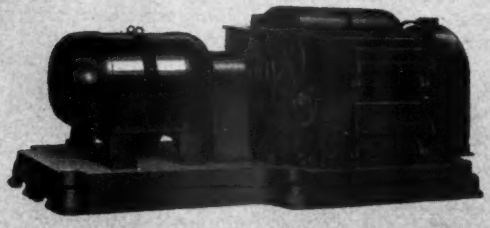
Laboratory Mill. 2 sizes. Capacities up to 2000 lbs./hr. Very efficient for coal sampling.



"13" Series. Three sizes. Capacity up to 6 TPH. For experimental runs, testing, and pilot plant operations.

THERE'S AN *American* ROLLING RING CRUSHER . . . FOR YOUR OPERATION!

"WC" Series. 4 sizes. Capacities up to 90 TPH. Available with drop cage. Compact, requires minimum headroom.



"AC" Series. 17 sizes. Capacities up to 800 TPH. Dual adjustability for easy size control. Drop cage for easy cleanout.

WRITE for details today. Describe your crushing needs.

American PULVERIZER COMPANY

Originators and Manufacturers of Ring Crushers and Pulverizers

1019 Macklind Ave.
St. Louis 10, Mo.

Here's the secret of alternate ROCKMASTER® teamed with alternate velocity loading

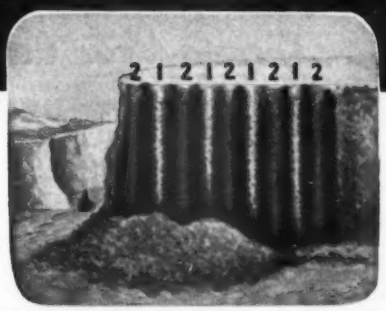
Alternate Velocity Loading is a newly introduced ROCKMASTER development which has produced astounding improvements in breakage and holds great promise for better blasting in mining, quarrying and construction work.

Every other hole is loaded with low velocity explosives. The balance are loaded with high velocity explosives. The faster ROCKMASTER millisecond delay caps fire the low velocity holes to stress the rock and the next delay interval releases the sharp second punch of the high velocity explosive.

The results of alternate velocity action can be seen in the photo above. The number one holes (which appear larger and lighter colored) were loaded with low velocity Apex and fired with No. 1 ROCKMASTER caps. The number two holes (which appear smaller and darker) were loaded with high velocity Apex and fired with No. 2 ROCKMASTERS.

All holes were initiated from the bottom to prolong confinement of the blast—giving maximum results of the alternate velocity loading.

At present Alternate Velocity Loading is being used only in quarry blasting, but it holds possibilities in many other fields. Talk with your Atlas representative about it. And send for your copy of the new Atlas periodical "Better Blasting" which details *the inside story* of Alternate Velocity Loading.



Absolutely no secondary breaking was necessary on this Alternate Velocity Shot. No. 1 holes show that explosive has worked longer on the burden than the high velocity explosive in the No. 2 holes.

ATLAS

ATLAS EXPLOSIVES

"Everything for Blasting"

ATLAS POWDER COMPANY, WILMINGTON 99, DELAWARE

Offices in principal cities

Before you buy:

COMPARE CLUTCHES!

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THOSE rig-beating rock jobs aren't so tough when you've got a shovel like the 2½-yd. Link-Belt Speeder K-580.

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Editorials

JOHN C. FOX, *Editor*

JUNE, 1953

To Serve You Better

SOMETIMES our readers write in to tell us what they think of MINING CONGRESS JOURNAL. Often a particular article will occasion a flood of letters—as is evident, for example, on page 96 of this issue.

For over a year now, we have been engaged in a systematic sampling of our readership to find out whether we are doing the job that should be done.

Our function, as we see it, is, first to serve as the medium for a free exchange of ideas among forward looking men in all branches of the mining industry. We strive to reach this goal by carefully balancing the articles we present in proportion to the interests of our readers.

Next we try to keep our readers apprised of what is going on in various mining districts and in Washington and to comment editorially on national issues that affect mining.

Bearing these objectives in mind the results of our sampling program have been interesting and encouraging. A number of individual readers tell us they would like to have more articles in their particular fields of interest. For example, a coal mining man writes "... would suggest you have more coal articles and fewer on metal mining." On the other hand, a metal mining man signifies a desire for "... less emphasis on coal mining and preparation and more on the problems of ore mining and beneficiation."

To resolve this dilemma we asked coal readers whether they found ideas valuable to them in the metal and nonmetallic mineral mining articles. More than three quarters of them answered, "Yes." Then we asked metal and nonmetallic mineral mining men whether they found ideas of value to their work in the coal articles. Again the answer was an emphatic "Yes." These, together with the preponderance of enthusiastic and favorable comments on other direct questions, give us encouragement. They indicate that the JOURNAL is pretty well in balance and is of value and interest.

They bear us out in our feeling that the value of a good mining magazine lies in its full coverage of the industry rather than narrow concentration on any particular branch of mining or on a few phases of its operation.

While we have tried to make our sampling program cover a representative cross section of our readership, every miner knows that the only true assay of a mineral deposit is contained in the mill reports over the life of the mine. A sample is still only a sample.

MINING CONGRESS JOURNAL wishes to know what its readership wants. If you are not among those sampled so far, won't you please let us know what you think of our efforts. We want the knocks as well as the boosts. Help us fill in the gaps we know must exist.

On Conventions and Expositions

IN A special section of this issue will be found a full report on the American Mining Congress 1953 Coal Convention and Exposition.

On all counts, this year's Coal Show truly deserved the description "Best ever." Over-all registration exceeded expectations; convention sessions were better attended; there were more exhibitors and more interested observers of the equipment on display, than at any previous show.

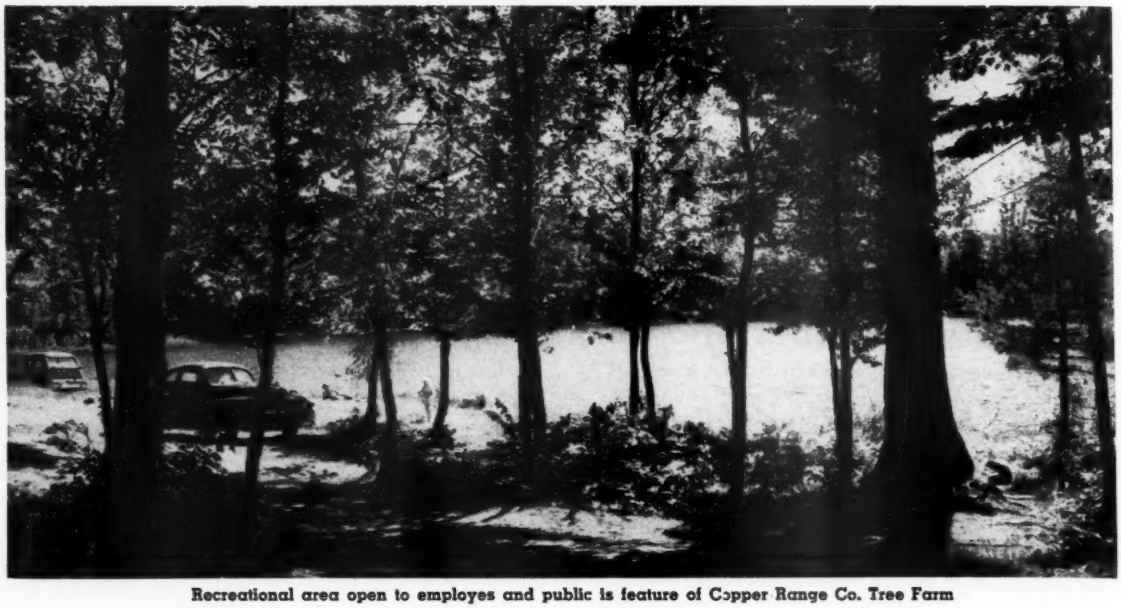
Particularly encouraging in its promise of greater mechanization for all branches of the mining industry was the attendance of large numbers of metal and nonmetallic mineral mining men. As brought out above, many of mining's production and safety problems are common to the entire industry.

Mining Congress conventions provide a convenient forum where practical mining men can discuss their problems and exchange information. The expositions provide them with an opportunity to see at first hand the latest developments in equipment and supplies. Together, they furnish rich soil for the seeds of progress.

Why the Journal Is Late

On May 18, the Columbia Typographical Union, No. 101 began a strike against the Union Employers' Division of the Graphic Arts Association of Washington, D. C. The strike lasted 17 days, during which most of the material for the June MINING CONGRESS JOURNAL was locked up in the strikebound plant.

Since June 4, when the typesetters returned to work, every effort has been made to make up for lost time. The result you now have before you.



Recreational area open to employes and public is feature of Copper Range Co. Tree Farm

Lake States Mining Companies Also Raise Trees

More Than Half Million Acres Of Scientifically Managed Forests Assure Perpetual Timber Supply

By JOHN CALKINS
Lake State Manager
American Forest Products Industries, Inc.

A SEVENTEEN-MILE logging road cuts a thin ribbon through Alger and Luce counties in Michigan's Upper Peninsula through a solid block of virgin hardwood forest owned by the Cleveland-Cliffs Iron Co. One of a group of visiting foresters traveling this road on an inspection trip asked Cliffs' Chief Forester, R. H. Ewalt, when cutting would start in this area. When he was told these timber lands had already been selectively cut, the visitor felt disconcerted, to say the least. Actually, selective cutting was started on these lands in 1942; but it was not surprising this question was asked, even by a forester, as evidence of selective logging disappears quickly.

Hundreds of thousands of acres of forests in northern Michigan, and thousands of acres in northern Minnesota are under expert forestry management by the foresters of the iron and copper mining companies. The Tree Farm of the Cleveland-Cliffs Iron Co. totals 288,000 acres; Copper Range Co.'s Tree Farm in Houghton, Keweenaw, and Ontonagon counties totals 70,078 acres and the company has another 70,000 acres under management which will soon be added to the Tree Farm program. The Oliver Iron Mining Division of the United States Steel Corp. manages over 100,000 acres of timber in Michigan's Menominee, Iron, Marquette and Gogebic counties, plus several thousand acres in the vicinity of the northern Minnesota iron ranges. Calumet and Hecla, Inc. has 100,000 acres under forest management in Keweenaw and Houghton counties which will soon be added to their Tree Farm system.

Pioneer Experiments

In the Lake States, mining companies were among the first to experiment with selective logging and sustained yield programs.

"None of us were too sure of our ground when we started this business of selective logging back ten years or so ago," says Maurice R. Schaller, superintendent of timberlands for Oliver. "Many people—and some good foresters—told us that it wouldn't work. It would be too expensive. Logging contractors wouldn't cut under that sort of contract. Blowdown would be too severe in thinned areas. But there was too much at stake for us not to give it a chance. Our mines need a perpetual supply of timber, and it takes a large forest area to supply them with just what they need at the right time. The whole economy of the region depended on these forests. Right here on the Menominee Range alone, over 200 families make their entire living harvesting timber from our lands. We're going ahead with confidence now. Ten short years have proved that we were right. We'll have timber harvests here forever."

Oliver Division mines use approximately 10,500,000 bfm of forest products annually, a large percentage of which is produced on the company's lands. Lagging, poles, ties, trestle timbers, round mining timber, cribbing, planking and lumber roll into the mine yards daily. But money-wise foresters see to it that the best use is made of every log.

Time was when thousands of board feet, of "white meated" maple, prized for veneer was shipped to the mines without regard for its value in other

markets. Such logs are now carefully sorted and sold to veneer mills at prices that help pay the dividends of every mining company stockholder. Of course some of the earnings are used to employ more foresters, mark more trees for harvest and put the whole forest in better condition. The results include a wider profit margin from the timber and higher quality trees that replace themselves perpetually. Selective cutting of timber lands gives young trees greater opportunity for sunshine and growing room.

The Copper Range Co., with its Lands and Forestry Division located in Houghton, Mich., has been a forestry pioneer. The company started selective logging in 1939. And, of course, there were problems. What to select? How much volume to remove? Who would log in these "new look" areas? The latter question was one of the most stubborn to answer. Copper Range forests, as is the case with the other companies mentioned, are logged by small local jobbers. Stumpage is sold by bid. The buyer of logs in turn lets contracts to one or more jobbers to harvest the timber for him. Company foresters mark each tree to be removed, in the case of sawlogs. The logging contractor cuts, skids, and hauls the logs for the buyer. At all times when logging is in progress a mining company forester is on the job. He scales each log before it leaves the woods.

Selective Logging Pays

Logging contractors of the old school at first shied away from taking contracts to log only marked timber. Over the years, however, and through a gradual educational program, these same men realize that it is more profitable for them to log in this manner, and selective logging will assure them of a perpetual source of timber to harvest.

Cleveland Cliffs Iron Co. was first to try experimental planting

Copper Range Co. mines at one time used 12,000,000 fpm of forest products annually. Lately, due to different mining techniques, this has dropped to nearly zero. Almost 100 percent of the allowable cut of several million feet per year is sold as stumpage and is a direct source of revenue to the company. The company's tree farm takes in some of the world's best hardwood stands, which are being put on a 16-year cutting cycle. The emphasis at present, as with most of the other mining companies, is on a quick "once-over" of the whole acreage to harvest mature or overmature timber that would soon be on the downgrade in growth and quality. Vigorous trees, regardless of size, are left to put on weight. Blowdown was a worry that early selective loggers had: would the thinned forest stay on its feet?

John "Jack" Noblet, Chief Forester for Calumet and Hecla, Inc., can answer that these days:

"We get less blowdown in the selectively logged areas than in virgin timber," Jack states flatly. "We've taken out the less vigorous trees and left the better ones. And they stay put."

But Noblet and his men do have a problem. SNOW. It snows for weeks on end in Keweenaw County. Five ft on the level is an average winter's snowfall. Consequently, it's hard to cut trees low to the ground. Although loggers in C. & H. forests stoop espe-

Every log is marked before cutting and carefully scaled before it is hauled from the woods

Someday this two-yr old pine seedling will produce useful wood for lumber or pulpwood

cially low in winter and dig holes in the snow for their chain saws, four-ft stumps often remain. Visiting foresters from lands where snow is a novelty often raise their eyebrows when Noblet takes them into copper country woodlands in summer. Such stumps! Jack Noblet merely advises them to come around sometime in February.

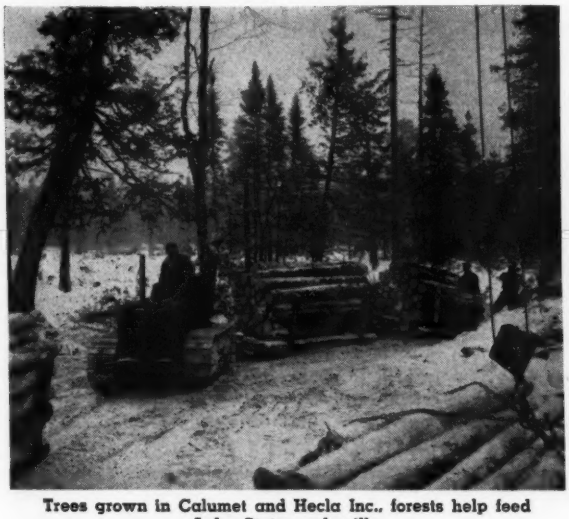
Even Use Stumps

Ingeniously, Noblet has discovered a way to make good use of the best of the tall stumps: Calumet and Hecla mines use thousands of mine rollers yearly. Rollers—upon which travels the "skip rope" cable which pulls mine cars—must be hardwood log sections 17-in. long, sound and clear. So loggers follow up the winter logged areas when snow is gone and salvage thousands of mine rollers by shortening the stumps!

their share. A Land and Lumbering Department with headquarters in Negaunee, was set up in 1896. In 1900 a forester was hired to make experimental planting. This was something almost unheard of at that time. Shortly after the turn of the century, a woodenware factory and veneer plant were built on the shores of Lake Superior. A tannery, located in the same town, used hemlock bark from company lands. Cedar ties, posts and shingles were also produced. Utilization was completed from the top quality veneer logs to the defective logs fit only for use in chemical plants.

The Cleveland-Cliffs Iron Co. started its forest management program in 1942. Since that time nearly 100,000 acres have been selectively cut. This sustained yield management plan provides for a 20-yr cutting cycle. Approximately 50 percent of the merchantable timber is removed during the first harvest. Several different methods of designating the trees to be cut have been followed. The most successful type of control has been to actually mark each tree that is to be cut. Early in the program some cutting was done to a diameter limit, but it was soon found that such a mechanical type of control was very difficult to enforce, and this type of cutting was soon abandoned. At the present time, every sawlog tree that is cut within the limits of the forest management area is marked for cutting by the company foresters.

The principal reason the company is in the timber business is to assure its mines of an adequate and continuous supply of all forms of mine timber. However, the size of the log that can be used in the mine is limited, as these round timbers must be handled by hand underground. Normally, the mines cannot use pieces larger than 16 in. in diameter. They also do not care to use pieces smaller than 10 in. in diameter because there is not sufficient supporting strength in these smaller pieces. The size of the average hardwood log from a selectively cut area is considerably larger than is desired by the mines. Accordingly, only 20 to 25 percent of the total hardwood production from the company's forests is of a size suitable for use in the mines. The logs that are too large for use in the mines are sold for the most part to sawmills within a distance of 150 miles of the forests.



Trees grown in Calumet and Hecla Inc., forests help feed Lake States pulpmills

Selectively cut spruce grew in region where first iron ore was mined in Minnesota

Deep shafts in Calumet and Hecla mines call for over 2,500,000 fbm annually: chute logs, stulls, chute poles, mine rollers, hard maple planking, hemlock ties, smelter brands and poles, and assorted lumber. Company forests, like those of other mining companies produce a huge excess crop to be sold as logs and pulpwood.

Timber Vital to Operations

Paul Bunyan would take another hitch in his belt before tackling the job that foresters of The Cleveland-Cliffs Iron Co. are accomplishing—managing 288,000 acres of fast-growing timber.

Forests have long played a vital part in the operation of Cleveland-Cliffs. Mines and mining railroads consumed huge amounts of timber. Charcoal ovens gobbled up thousands of cords of hardwood, while a chemical plant and paper mill consumed

Buy Mine Timber

Two Cleveland-Cliffs mines operate modern electric saw mills to produce stulls, cribbing, ties and lagging for the mines. Logs from these mills, however, are not always purchased from the company's land.

The company is now logging timber on Grand Island in Lake Superior, a 13,000-acre unit of their Tree Farm. This is strictly a summer operation requiring a tug and barges to haul the loaded trucks the six-tenths of a mile distance to the mainland at Munising, Mich. A summer resort is maintained by the company on the Island that is open to the public for recreation, as are all Cleveland-Cliffs Tree Farm areas. An annual harvest of several hundred gallons of maple syrup is also made on the Island.

First Planting in 1903

The company tree planting program dates back to 1903 when a 35-acre experimental area was planted. The first commercial thinning in this planting was made in 1946. The company has not done any planting during the past

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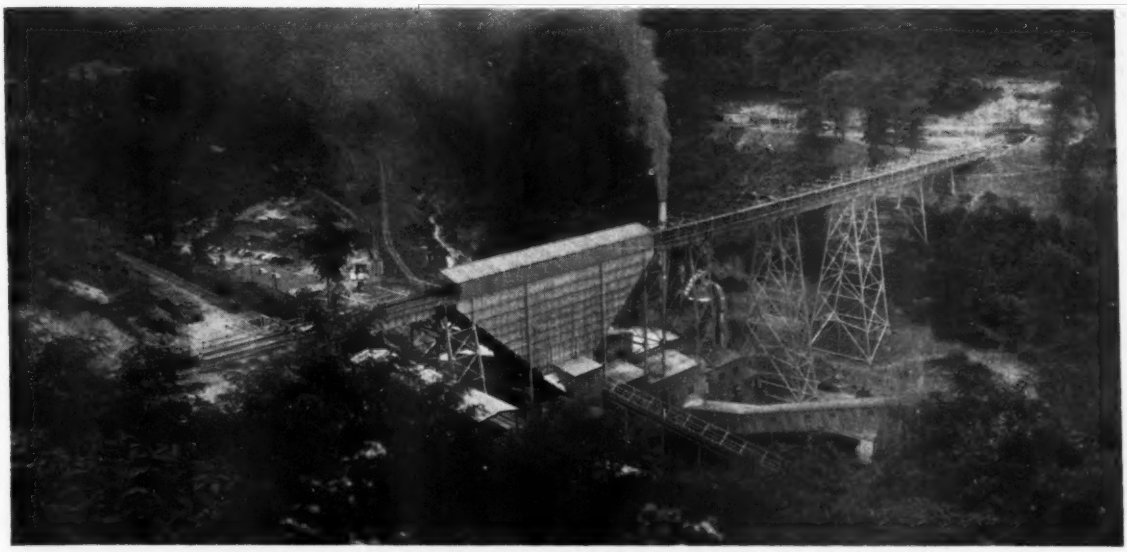


Raw coal storage bins solved the problem of fluctuating loads on the cleaning plant

Mine Operating Factors That Affect Coal Preparation

Changes in Mining Equipment and New Market Requirements Emphasize the Importance of Correct Design for Today's Coal Cleaning Plants

By R. L. LLEWELLYN
Preparation Engineer
Eastern Gas & Fuel Associates

THE purpose of this paper is to briefly describe how the following factors affect the operation and results of a coal cleaning plant.

(1) Run Of Mine (ROM) Crushing
(2) Raw Coal Storage
(3) Continuous Mining
(4) Three Shift Operation

These are not listed in order of importance but are independently discussed so that the advantages or disadvantages may be applied to any mine operation. Each point should be carefully evaluated before the installation of a new cleaning plant or the revamping of an existing one is contemplated.

It is to be noted that no mention is made of the loss in realization caused by increased amount in fines experienced with the first three factors. This is an item not to be overlooked. However, each company must make the decision on how important the loss will become to its particular operation.

Crushing Problems Increased

Crushing is not new. Over 50 years ago rotary breakers were installed on softer coals with the rejects discarded as they are today. Crushers have also been in use for as long a period. The desire for coarser sizes retarded wide spread use of breakers and crushers on rom in the past. Market changes and excessive labor costs for hand picking have caused operators to consider crushing facilities either in new cleaning plants or in the modernization of existing ones.

Mechanical mining has reduced the amount of coarse coal, but with full seam mining, large pieces of slate still have to be handled from the mine cars. This has been a problem. The term "full seam" better describes the product than "run of mine." There is no question that controlling the top size in the feed to preparation plant facilities is desirable, especially from a maintenance angle. Large pieces of slate or sandstone have sharp edges which, when discharged onto a conveyor, cause belt damage, thereby shortening the life of the belting. These large pieces will also cause serious trouble in flight or apron type conveyors as well as aerial tramway refuse disposal systems.

In the investigation of crushing to eliminate hand picking, one must consider the possibility of contaminating the fines. While eliminating hand picking seems desirable before a plant is built, it is not always practical. This was illustrated in a plant designed for a new mine several years ago. Picking facilities were provided in the face of inadequate data. Later an experiment was conducted by diverting the rom into the rock bin and rock crusher and then testing the change in feed to the washer. The results indicated a slight contamination of the ⅛ in. by 0, and an increase in washer rejects from 14 percent to 22 percent. The primary reject elevator was overloaded but this can be remedied by either increasing the speed of the elevator, or the number of buckets, or both.

Another important observation made during the test was that large flat slate pieces in the washer feed caused difficulty in reject mechanism and elevators. Thus, by installing a suitable crusher for the rom material, it is now felt that pickers can be eliminated with advantage. It is evident, therefore, that a number of important

factors must be resolved before deciding to crush unpicked rom. In the case of a new mine, it may be necessary to wait until the new plant is in operation before determining if crushing is economical. At the mine where the above test was conducted, all the 5-in. by 0 raw coal was being cleaned and mechanical and thermal drying had already been installed.

Choose Crusher Carefully

Selection of the crusher or breaker is the next problem. Manufacturers have kept abreast of the requirements for the coal industry by fabricating a unit which is being used in crushed stone plants. A rotary breaker is usually recommended where the rejects are hard and the coal is soft. The drum contains perforated holes of the top size desired. Raw coal is collected in a hopper below the breaker and the rejects are discharged at the opposite end from the feed. Large slate, wood, tramp iron and other foreign materials are in the rejects which can be sent directly to the disposal system. At two recent installations, one new and the other a remodeled plant, crushers were used to reduce the large slate from the breakers for easier handling and to minimize the chances of fire in the disposal area.

There are single and double roll type crushers which can be used for the severe duty of reducing run of face to a nominal top size before washing. They are expensive because of the rugged construction involved to take the full production from the mine. Magnetic protection ahead of the crusher should be considered but is not always practical. Therefore, some manufacturers have designed accordingly. The expected top size of feed has an effect on the selection, the diameter, and the width of the rolls. If the diameter is not sufficient to "bite" the piece, the slab could lay on top of the roll and prevent any tonnage to pass through the crusher. The same is true for the width. The cost of the crusher is not changed very much by the width so neither manufacturers nor operators should try to cut the size of the unit by even six in. if the maximum size to be handled can be definitely established.

The segments and teeth are developed by experience to do a job of meeting requirements. The operator wants a trouble free unit to crush anything that comes out of the mine cars without oversize and with a minimum of slack in the product. An underpowered crusher will not accomplish the job and it is cheaper to buy a large motor with the initial installation than to make a replacement. One company usually provides a motor one size larger than is recommended by the crusher manufacturer, as an extra safeguard.

Raw Coal Storage Useful

Certain coal companies have long recognized the importance and advantages of storage bins ahead of cleaning plants. Uniform feed and blending are necessary for ultimate cleaning results. However, since the decrease in the market for lump sizes, several mine operators are installing large capacity bins to assure steady operation of the preparation plant and to permit mine operation without delays due to troubles or breakdowns at the cleaning plant.

In the past storage capacity has been provided by mine cars. This is expensive and not always satisfactory. The general practice is to dump as quickly as possible so that the empty cars can be returned to the working places. This procedure upsets the steady feed to the plant. At mines where railroad car shortage is acute or service is not dependable, storing a full shift has been considered by a few operators so that the mine can complete the shift even if railroad cars are not available. Also, where the preparation plant is operated three shifts, the storage capacity is made sufficient to allow the mine to operate only two shifts.

How Much To Store?

There is considerable difference of opinion on the storage tonnage to be provided. Somewhere between no bin and a full shift capacity may be the answer to the problem at a particular mine. With proper storage, overloading the washing equipment is minimized because the plant can be operated on stored coal when there is no coal at the dump. Efficiency of the washer and screening equipment is increased due to a constant and more uniform feed from the bin.

With large storage bins, there are problems which should be resolved to obtain the recognized advantages. Hillside or drop bottom type bins are not included in the following comments.

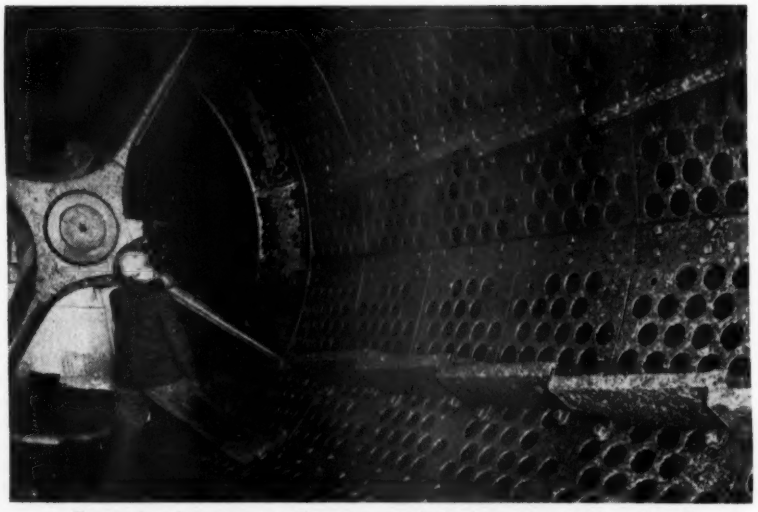
(1) *Degradation* — To keep the breakage of coal at a minimum, spiral chutes or lowerators are used inside the bins to eliminate excessive drops. With soft friable coals, it is sometimes desirable to remove large rejects which would crush the coal ahead of binning. The bin should not be run empty and to assure this condition, low level indicators can be electrically connected with the bin feeder to stop it at a predetermined level or to signal the operator to stop the unit. A coal pile in the bottom can act as a "cushion" when filling the bin again.

Excessive degradation, if not prevented, can cause difficulties with screening, washing, conveying and solids recovery systems in the cleaning plant.

(2) *Segregation*—When an expenditure for binning is made with the idea of improving efficiency by providing a more constant and uniform feed, segregation can upset the expected results. With coarse coal rolling on the pile to the side of the bin and a core of fine coal in the center, surges of fine and coarse coals alternately will be fed to the cleaning plant on occasion which is diametrically opposite to what is intended.

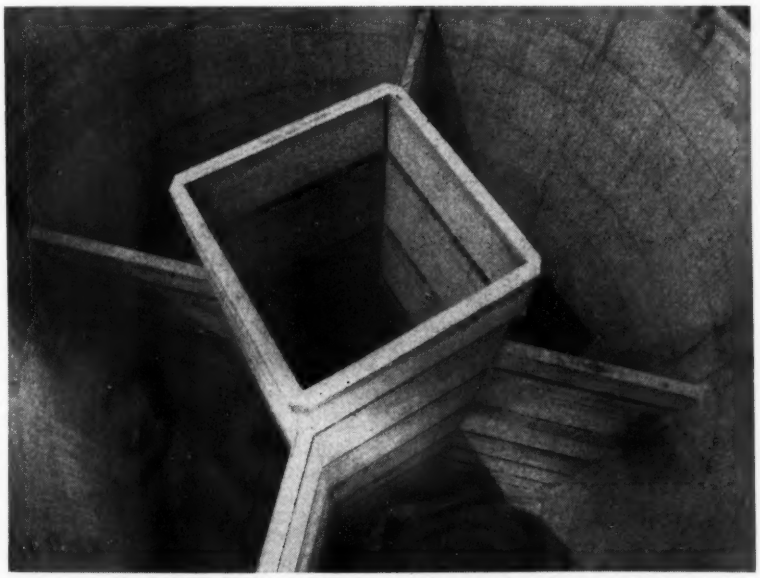
Partitions are used to prevent segregation at most installations and some success has been reported by layer feeding from a distribution conveyor. How the problem is resolved is a very important detail to work out when the bin or bins are designed. If overlooked, good results cannot be expected.

(3) *Effective Storage*—Plant opera-



Rotary breakers are usually recommended where the coal is soft and the rejects hard

tors have to learn how to use a storage bin to the best advantage. Unless carefully watched, the bin can be run empty and act only as a big expensive chute or, conversely, the dumping rate into the bin far exceeds the cleaning plant capacity and therefore the bin is kept full. Either condition, of course, is unsatisfactory. There should be some regulation whereby the bin will usually have sufficient coal to keep the cleaning plant running continuously between mine car trips and at the same time, have storage capacity to dump cars in case of minor plant delays. Where rock and coal are being handled alternately by the same dump and conveyor, a certain amount of storage is a necessity to keep up the normal mine production.



Sectionalized storage bins prevent segregation of the coal

At one mine, it was necessary to run the cleaning plant overtime due to loss of time caused by delays in the plant or "out of coal" periods. After the bin was installed, overtime was practically eliminated and daily production still maintained.

Depending on the location of the bin and how dusty the coal, a dust collection system should be seriously considered when planning the installation of a bin. There is always some machinery at the bin structure which requires maintenance and proper attention will not be given if the dust remains unchecked.

Continuous Mining & Coal Cleaning

Recognizing the need for study of the problem, the Surface Preparation Committee of the American Mining Congress appointed a group to gather information for a report on the preparation problems of continuous mining. It was felt that the exchange of information would be most helpful to the whole industry and from the angle of preparation, one could use the data to help resolve problems involved at any individual plant.

Reports of the committee to be published in the near future will show comparison between conventional mining and the various types of continuous mining machines. It is not intended here to discuss the details of screen analyses, nor the change in ash for any particular size. Rather, it is to list experiences from these reports which will have the most effect on the performance cleaning plant equipment.

(1) With the exception of possibly one machine, the plus five-in. size is reduced considerably in continuous mining. In fact, one report on the Pittsburgh Seam showed the plus five-in. amounted to less than the nominal allowable oversize if the lump were crushed to that size. Therefore, the continuous mined coal would be in an acceptable top size to be introduced into the washer feed. This could be an advantage because it would possibly eliminate the need of picking or rom crushing facilities.

(2) Fine coal screening at some mines is affected by both an increase in moisture due to spraying at the face and the increase in the percentage of fines. Existing plant capacity is reduced to compensate for continuous mined coal or, where possible to expand, additional screening area may be provided. Inadequate prescreening ahead of washer units will cause further troubles in settling tanks and sludge handling units as well as in heavy media recovery. It is to be recognized that where high moisture is causing blinding, additional screens do not always solve the problem completely.

(3) Impurities in the fine coal have been reported to be increased with continuous mining machines. One mine claimed difficulty in keeping the machine within the seam itself. Fine coal cleaning may become necessary at mines where high quality slack must be maintained. However, this may be equally true under conventional mining.

Consideration should be given to predrying where air cleaning is used and where moistures are too high. One study in the Pittsburgh Seam revealed that a 60 percent increase in the amount of 20m by 0 coal was obtained after the continuous miner was used. This means there was a greater proportion of coal not cleaned by air and if the ash is high in the uncleaned segment, the final ash in the cleaned product will be higher.

(4) With solids recovery and water clarification systems, it can be expected that unless provisions are made for the proper capacities, the clarification problem will be aggravated with continuous mining. Again, from the subcommittee reports, the amount of 100m by 0 and 200m by 0 is increased better than 50 percent and this is the critical size when engineering the clarification system.

One must remember that the above points only serve as a caution to those who intend to convert from conventional loading equipment. There is no standard formula to solve the problem of handling the additional fines. Each mine needs to be considered as a problem in itself.

Three Shift Operation

The main purpose of operating a cleaning plant three shifts is to gain production with a minimum initial cost. Coal companies are looking into the idea because of the large expenditures required for cleaning plants as well as the need for cleaning a greater percentage of the product. This is particularly true where the slack must be cleaned, dewatered, and heat dried.

To illustrate the comparison in costs, a mine with 4800 tpd of raw coal would normally require a cleaning plant capacity of 800 tph for a single shift, 400 tph for two shifts or 267 tph for three shifts. One can readily visualize the amount of equipment involved for an 800-tph plant and its corresponding price. The difference between a 267 and a 400-tph cleaning plant is still something to consider pricewise.

It is not claimed that a three-shift operation is the most economical approach to the over-all picture. Manpower required to operate and maintain the outside plant is often stagger-

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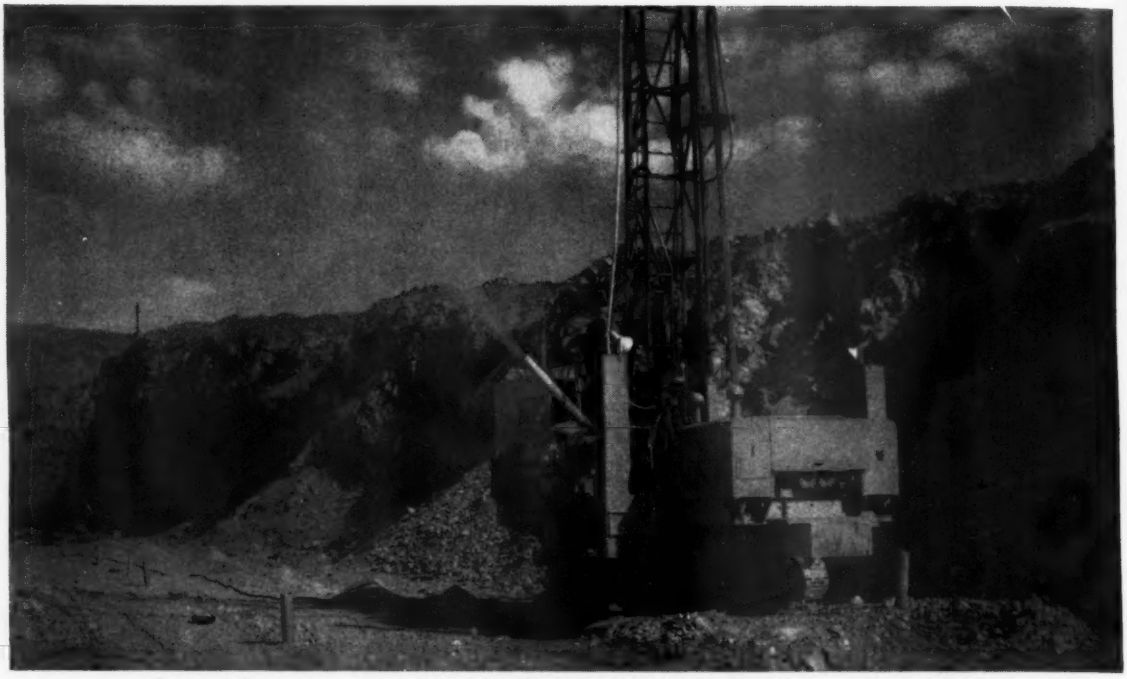


Rotary drilling was not new—just its application to blastholes and use of air to expel cuttings

Rotary Drilling in Open Pit Operations

One Drill Replaces Six Wagon Drills to Produce 41.2 Feet Per Hour, Including Moves, In Utah Mine

By GEORGE R. PUTNAM
President
Utah Construction Co.

IN March of 1951, our drilling concept changed upon receiving and trying out our first oil-well type rotary drill for blast hole drilling. There was nothing new about rotary drilling except its application to the blasthole field and the use of air to expel the cuttings and cool the bits as compared to liquid.

The machine received was a Joy 58-BH Heavyweight Champion, weighing about 48,500 lb. The drive was powered by a 50-hp electric motor, the compressor rated at 554 cfm powered by a 125-hp motor, and a centrifugal type dust collector powered by a five-hp motor. This drilling machine was self-propelled on crawler tracks and drilled dry, eliminating need for water. The mast was designed to handle a 40-ft drill stem.

Prior to delivery of the new machine at the Cedar City, Utah, open pit iron mining and stripping operation blast hole drilling was done with wagon drills. Some use had been made of churn drills, with poor results due to water problems in this semi-arid area and also to other problems peculiar to this particular operation.

Wagon drilling required six to 10 drills, depending on the material, to maintain adequate muck for each six-cu-yd shovel, whereas one rotary drill is able to produce enough volume to keep ahead of one six-cu-yd shovel. The replacement eliminated not only wagon drills but considerable payroll, air, pipe lines, steel,—nipping costs, servicing, etc.

Experience with the original Joy drill shows approximately 4,000,000 cu yd of overburden drilled. Overburden consists of limestone, sandstone, caliche and quartzite. The overall drilling speed has averaged 41.2 fph, including moves.

Adopt Oil Rig Bits

We have subsequently placed two additional machines in operation in the Cedar City area and one in the Salt Lake City area, all 58-BH Heavyweight Champions. The machine in the Salt Lake City area, drilling in porphyry and quartzite has produced 59,227 lineal feet of hole in 1975 hr for an average of 30 lineal fph, including moving. Bit life on the original machine at Cedar City has averaged 1800 ft with one bit used primarily in soft limestone and caliche showing 6000 ft before failure.

We have been told that experience in limestone and dolomite quarries shows progress on 6½ in. bits of from 20 to 35 fph and a bit life ranging from 600 to 2500 ft.

At the beginning of our experiments Hughes Tricone bits were ordered in 6½ in. and 7⅞ in. sizes with a range of types recommended for various hardnesses of material. We have now standardized on 7⅞ in. bits since most failures occur in the bearings and the larger bit with correspondingly larger bearings outwear their smaller brothers.

Fragmentation in the hole is obtained through a combination of cutting and crushing action calling for a particular type of bit for soft, medium, and hard rock—these bit types will be discussed later. Upon frag-

mentation the particles are blown up around the bit and drill stem and into the dust collector and hopper. Air passes through the drill stem and through air ports in the bit. In addition to forcing cuttings from the hole, air also cools the bit and bearings. A rotoclone picks up dust and discharges it through a stack into the air away from the machine. Large particles are allowed to pass through the hopper into a pile near the machine. Cuttings can be collected into the hopper box for sampling,—however, the hopper gate is left open on our operation allowing cuttings to pile up on the ground.

This pile serves a dual purpose—first, it collects all material from the hole for easy mineral sampling; second, the material is handy and usually excellent for stemming.

Causes of Downtime

Our machines have an availability record of about 75 percent. Principal down time has been due to chuck assembly failure. Another down time cause is wearing out of rotoclone blades and housing due to the sand blasting action. Some work is being done to rubberize these parts to reduce wear. Drill stems, which are square in cross section, wear off on the corners through sand blasting and rotation in the holes. After a certain amount of wear chuck jaws can no longer grip the stem at which time we rebuild the corners. Drill stems sometime bend under pressure exerted on the bit. Bad bends are heated to straighten, others are straightened cold. Drill stems become so badly bent after drilling around 20,000 to 25,000 lineal feet that they have to be discarded. In our case this means two stems,—one 20-ft, one 30-ft, or 50-ft total—so, the average life would be about 500 ft of hole per lineal foot of stem.

Combination of cutting and crushing actions makes tricone bit effective

As stated previously, various types of bits are used, depending on the rock formation. The difference in bit types is in the tooth design, small teeth for hard rock and large teeth for soft rock. All are Tricone, each cone rotating on roller and ball bearings. In hard formation Hughes Type W7R is used with an application of 700 to 750 lb hydraulic pressure; in medium hard drilling Hughes Type OWC with 600 to 650-lb hydraulic pressure, and in soft material we use Hughes Type OSC with 450 to 500-lb hydraulic pressure. At 450-lb hydraulic pressure a pressure of 19,800 lb is developed on the bit; at 750-lb hydraulic pressure, 33,000 lb is obtained. It is primarily the crushing action that produces fragmentation.

Recently at one mine, a formation of quartz was encountered where bits were failing at around 100 ft of usage and drilling speed was cut to 13.5 fph,

Six to ten wagon drills were needed to maintain muck for each six-cu yd shovel

Rotary drills eliminated considerable payroll, air, pipelines, steel, nipping costs and servicing

whereupon the Hughes people supplied their tungsten carbide insert bit, Type R1, in 6¾ in. size. This is one of the types used in oil well drilling. Failure occurred at 1108 ft as a result of wearing the shoulder away from bearings and exposing the bearing. The average drilling speed was 32 fph, excluding moves. The Type R1 bit used with an application of 800-lb hydraulic pressure developed 35,200 lb on the bit. This particular bit did not have air vents required to keep bearings cleaned and cooled. We have subsequently ordered bits of this type with air jet features for cooling and cleaning bearings which we expect will increase bearing life.

Has Four-Speed Rotation

The drilling machine is geared with four rotation speeds which are transmitted to the bit. The first gear runs up to 17 rpm, second gear to 33 rpm, third gear to 45 rpm and fourth gear

up to 80 rpm. Rotation speed has to be correlated with hydraulic pressure, decreasing as hydraulic pressure is increased. This is principally to avoid tooth breakage on bits. Fourth gear is used up to 625-lb hydraulic pressure. Above this pressure the slower speeds are used depending on pressure applied to the bit.

Gage wear which exposes bearings in the bit cones is the principal factor in failure. At the beginning bits were reconditioned at various points of

Bag powder is used in oversize holes, cartridges in straight, clean or wet holes

wear before failure, but the practice was abandoned when it was found that the cost of reconditioning of the bit after reconditioning was not warranted by longer life. Original bits are now run to failure.

In overburden, drill holes average about 40 ft in depth. In mining iron ore 25 to 30-ft holes are used. The shorter holes do not appreciably decrease drilling speed due to the mobility of the drill rig. Moving and set-up time ranges from three min on well-kept benches to eight min where going is rough. Three centrally controlled hydraulic jacks provide fast leveling at set-ups.

Drill stems 20 ft and 30 ft long are used, these are rapidly screwed together as depth of hole progresses. Holes 80 ft deep have been drilled but for general blasting work the shorter holes are more adaptable.

Blast hole spacing, as in any type of drilling, depends on type of rock encountered. Good results have been obtained from spacing as great as 35 to 40 ft in caliche. The general spacing in iron ore is about 12-ft centers and in limestone 18 to 22-ft centers.

An interesting point is that on lost holes, about 10 percent of all holes drilled, time is saved by drilling a new hole. This can be accomplished faster than setting up and centering over the lost hole. Use of an air jet and auxiliary compressor capacity is being considered to supplement the blowing capacity to better remove the cuttings from outsize holes caused by caving in soft ground. The Hughes people claim their bit is designed to accommodate an air velocity of 3000 lineal fph in the annulus of a hole drilled by the 7⅞ in. bit using 550 cfm compressor capacity. This velocity is of course reduced as the size of the hole increases.

Blasting Practice

Shooting is done with cartridge or bag powder. In oversize holes we use bag powder of strength suitable to rock encountered and in straight, clean holes, or wet holes, we use cartridge powder. Cartridges come two to a 50-lb box, diameter recommended is ¾ in. to one in. less than hole size and cartridges are approximately 24 in. long. Primers and detonators used depend upon the material being blasted and also upon whether blasting single or multiple rows of holes.

Limitation of this equipment has not yet been found. There has been no difficulty drilling damp material, but the method changes in that the roto-clone is shut off and the hood removed from top of hole so that cuttings are expelled around top of hole. Wet ground can be drilled but changes in the machine are necessary so that water rather than air is used to return cuttings and bits of the oil well type are substituted for air jet bits.

Naturally, the limitation of the rotary type drill and Tricone bit was a matter of concern. It was feared that when very hard rock was encountered, progress would be slow and bit cost out of line. However, upon completion of the experiment with the tungsten carbide insert bit many doubts were quieted. It is now felt that most types of rock encountered in open pit mining can be drilled wherever work worthy of the investment and adaptable to production drilling is met.

Coal Preparation

(*Continued from page* 43)

ing. In many cases there are more personnel outside the cleaning plant proper than inside—counting dumpers, trimmers, droppers, refuse disposal and shop maintenance men.

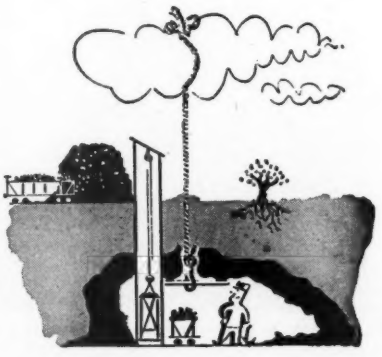
However, once the decision is reached to operate three shifts, particular care must be exercised in designing the plant. There is little or no time to "catch up" delays or breakdowns and at the same time to maintain production. Units which are wearing out at a faster rate must be kept in operating condition. Preventive maintenance should be an established procedure and the selection of the men responsible for keeping the plant operating is very important. The machinery and component parts are complicated and the mechanics ought to be trained to service and repair machines which usually costs more than the best automobile money can buy.

Regular repair and maintenance will have to be done on weekends. This involves overtime. One captive plant that has been operating on a three-shift basis for over 20 years has a schedule of 40 hours of continuous operation and eight hours for maintenance, seven days per week. This arrangement cannot always be adopted at commercial mines where irregular work time is directly related to market conditions.

Care in the selection of spare parts and standby equipment necessary for uninterrupted operation is essential. This can be overdone and will result in an excessive inventory in the warehouse and unnecessary expenditures. Good judgment based on experience by those responsible for the plant is needed. When planning a new cleaning plant for three-shift operation, during the design stage a study should be made to determine where standby units will be most effective. And, if possible, conveyors, screens, piping and chutes should be made heavier than standard practice to withstand wear and prevent breakdowns.

Conclusion

Each of the four factors discussed above is important in the design of a new plant or for the modernization of an existing one. While it is claimed that the heart of a cleaning plant is the washing unit, it now represents only a fraction of the total cost. Therefore, careful analysis and investigation of the effects of these factors should be made individually before resolving the problems of preparation today and in the future.



Only by testing can you be sure of the job roof bolts are doing

Roof Bolt Testing

A Report of the Roof Action Committee Describing Tests to Determine Bolt Tension and the Load Bearing Capacity of the Bolt Anchorage

By L. A. PANEK
W. J. LEWIS
J. H. SCOTT
Subcommittee Members

TENSION in an installed roof bolt may be determined by measuring the torque required to tighten the bolt, or by pulling the bolt and noting the load at which the roof plate loosens. The greater the tension in a bolt the more torque must be applied to the head or nut to tighten it, all other things being equal. The relation between torque and tension may be considered to depend chiefly on the nominal bolt diameter and on the friction between the surfaces of contact (between the threads and under the nut or head). For a given bolt diameter and for given conditions of friction, if the relation between torque and tension is known, then the tension in a bolt can be predicted by measuring the torque required to tighten the bolt. This is the basis for the use of a torque wrench to determine tightness of roof bolts. It is important to realize that the predictability of bolt tension, and therefore the value of torque measurements on roof bolts, depends on the degree to which the conditions of friction are consistent, or reproducible, from bolt to bolt.

Tests made underground by the U. S. Bureau of Mines indicate that about 40 lb (±10 lb) of tension is developed in a one-in. wedge type bolt for each foot-pound of torque applied; thus 250 ft-lb torque represents about 10,000 lb tension. Two manufacturers report that for ¾-in. shell type bolts about 65 lb (±15 lb) of tension is developed for each foot-pound of torque; thus 125 ft-lb torque represents about 8,000 lb tension.

It is emphasized that the above figures are applicable only if all of the following conditions, which affect the friction, are satisfied. A bolt selected for torque measurement should be straight; the head or nut should bear evenly on the roof plate; the threads should be clean and free of rust; the bolt should not have "run out of thread" owing to improper installation. The torque wrench should be of the type that indicates the actual torque rather than the maximum torque. It should be checked periodically to insure that the dial reads correctly, and should be treated with the care due a measuring instrument. In use, a steady force should be applied to the wrench, and the dial should be read while the wrench is in motion.

If these conditions are not satisfied, the torque-tension figures given above must be regarded as very rough approximations. Any factor that increases friction, such as a nut that gouges the roof plate, or the presence of considerable rust on the threads, may require a much higher torque reading to achieve a given bolt tension. Excessive lubrication will decrease the torque required to obtain a given bolt tension. Erroneous results due to excessive friction are likely to be much greater than those

due to excessive lubrication. The objective is not to create torque but to create bolt tension.

Torque-Tension Relationship

The torque-tension relationship for bolts used at a given mine may easily be determined underground, and should be done if there is any reason to suspect that local conditions deviate from those specified above. The equipment needed is a torque wrench and a hollow-ram type hydraulic jack with attached hydraulic gage that indicates the pounds of load exerted by the jack.

Test procedure, using a shell type bolt, is as follows. The ram of the jack is extended about ½ in. from the closed position. The jack is placed on the bolt, right side up, with a roof plate above and below it. The bolt is inserted in the hole and tightened enough to hold it in place. The torque wrench is used to tighten the bolt, which compresses the jack against the roof and produces a gage reading equal to the bolt tension. Bolt tension is read on the gage for several torque values. If the true torque is to be measured, friction conditions under the head of the bolt must be similar to those normally present. Hence it is necessary to prevent rotation of the jack or the roof plates whenever a torque reading is being taken. The procedure using a wedge type bolt is the same except that the bolt is anchored before the jack and roof plates are installed. Since the results will probably vary considerably, tests should be made on enough bolts to determine the range of bolt tension that may be expected for a given torque.

The Plate-Tapping Test

Another way to determine the tension in an installed roof bolt is to pull the bolt, using a jack, and tap the roof plate to find at what load the roof plate loosens. Obviously the jack cannot bear against the roof plate during the test, so some sort of bridge must be used to transmit the jack load to the roof without touching the roof plate. Required equipment consists of a hydraulic jack with attached load-indicating gage, a loading bridge, a small hammer, and a bolt extension (short length of alloy bolt) with an adapter to connect to the end of the roof bolt. The bolt extension transmits the pull from the jack to the bolt.

Wedge Type Bolt Tests

For the wedge type bolt the test procedure is to first install and tighten the bolt in the usual manner (or any previously installed bolt may be selected). Pulling equipment is attached and load applied gradually. The roof plate is tapped lightly with the hammer to detect, by sound

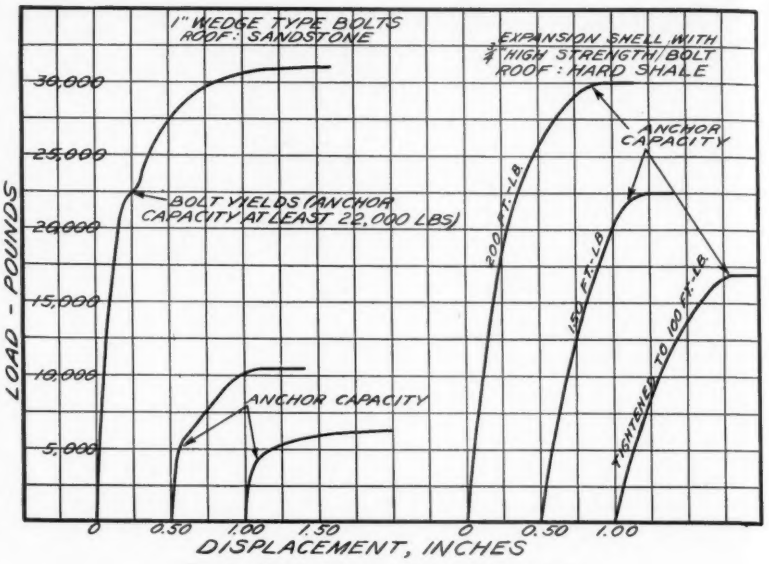
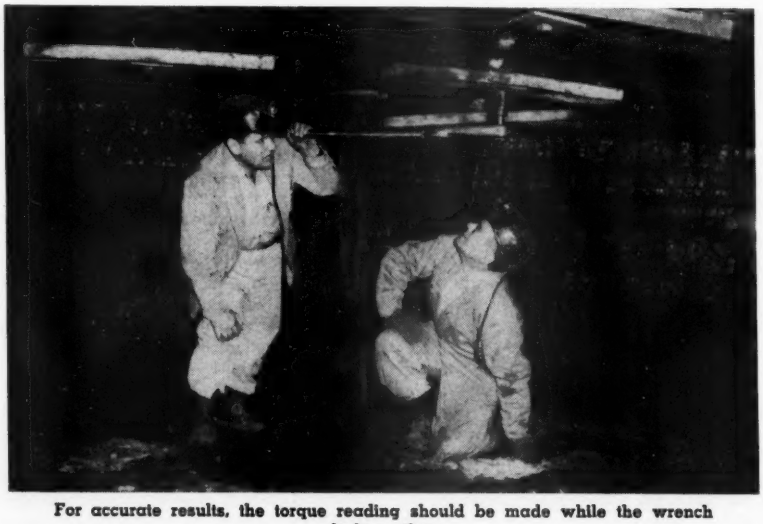


Fig. 1.—Results of some bolt anchorage tests

change, *exactly* when the plate loosens. Simultaneously the jack load is read on the gage. Skill can be developed in deciding the point of plate loosening.

The true point of plate loosening occurs when it seems "almost loose," just before it is entirely free. This is because one is actually trying to determine the minimum jack load at which the nut on the roof bolt no longer exerts pressure against the roof. Since the roof is not perfectly flat, the plate will not be free until additional load causes greater bolt elongation.

Tests by the USBM, using electrical strain gages to measure the load on one-in. by 4-ft. bolts installed in firm sandstone or shale, show that before the plate-loosening load (L) is reached, the bolt load equals the initial (installed) bolt tension plus about 35 ± 15 percent of the jack load, and that the bolt load equals the jack load when the latter equals or exceeds L. This means that when the jack load is less than L, the bolt load ordinarily is not known (no strain gages being used); the bolt load is greater than the (unknown) installed tension and less than L; it may be several times the jack load. Moreover, the installed tension is only about 65 ± 15 percent of L. This percentage will be increased by any factor that tends to increase the downward displacement of the bolt end (during the test), relative to the springing back of the roof rock compressed under the roof plate. For example, a more rigid rock, a thinner bolt, or anchor slip.



For accurate results, the torque reading should be made while the wrench is in motion

Shell Type Bolt Tests

For shell type bolts the test procedure differs from that for wedge type bolts only in that the pulling adapter, which must pass under the head of the bolt, normally is attached before the bolt is installed. The adapter should make contact with the roof plate in the same manner as the bolt head in use, so that head friction will be normal. Test results obtained by a manufacturer show that when the jack load is less than L, the bolt load remains equal to the (unknown) installed tension, and is greater than the jack load. Bolt load equals the jack load when the latter equals or exceeds L. Consequently, the plate-loosening load (L), read on the gage, equals the installed bolt tension. This behavior is attributed to the fact that the tendency for the bolt load to increase with application of jack load is counteracted by the downward movement of the plug in the expansion shell (anchor slip).

Caution must be exercised in interpreting test results if the bolt is first installed to a given tension, then loosened or removed to permit the pulling adapter to be attached. If the test is begun with the bolt re-installed to a tension less than the original installed tension, the bolt will behave like a wedge type bolt until the bolt tension reaches the original installed tension. This situation arises if a previously installed bolt is selected for test. The fact that torque is measured before loosening the bolt and the bolt is re-installed to the same torque gives little assurance that the original tension has been duplicated, owing to the approximate nature of a torque measurement. Under these conditions the plate-tapping test is of doubtful value, and therefore is not recommended.

Testing Bolt Anchorage

The anchorage test consists of pulling an achored bolt until its measured displacement becomes excessive. The displacement measured is that of the lower end of the bolt extension; it is the change in distance between the end of the bolt extension and the floor.

For the wedge type bolt the required equipment consists of a hydraulic jack with attached load-indicating gage, a bolt extension with an adapter to connect to the end of the roof bolt, and a device for measuring the displacement of the end of the bolt. The latter device may incorporate a dial gage or vernier caliper. Although this test may be combined with the plate-tapping test to determine installed bolt tension, the practice is not recommended, because it may lead to erroneous conclusions. If it is desired to test a previously installed bolt, the bolt tension should first be relieved.

The test procedure is as follows. The bolt is installed according to normal practice, except that it is not tightened. The pulling equipment is attached and the displacement measuring device placed in position. Load is gradually applied to the roof bolt, and the displacement is measured for each load increment, say 2000 lb. Fig. 1 illustrates some test results. Load is increased until the anchor slips, the bolt yields, or the bolt breaks, as desired.

Anchor slip is indicated if bolt displacement occurs without corresponding load increase, at a load less than the yield load of the bolt. During test, anchor slip may be exhibited in one of these ways: load drops when jack is being pumped; load fails to increase when pumping, but displacement increases; displacement increases suddenly. Anchorage strength cannot be determined if it exceeds the yield load of the bolt (about 20,000 lb minimum for a one-in. mild steel bolt) because a greater than normal displacement may be due to bolt deformation rather than anchor slip. If large displacement increase occurs at 22,000 lb for example, it is correct to say only that the anchorage strength is at least 22,000 lb. For this reason the test usually is discontinued when the yield load of the bolt is reached.

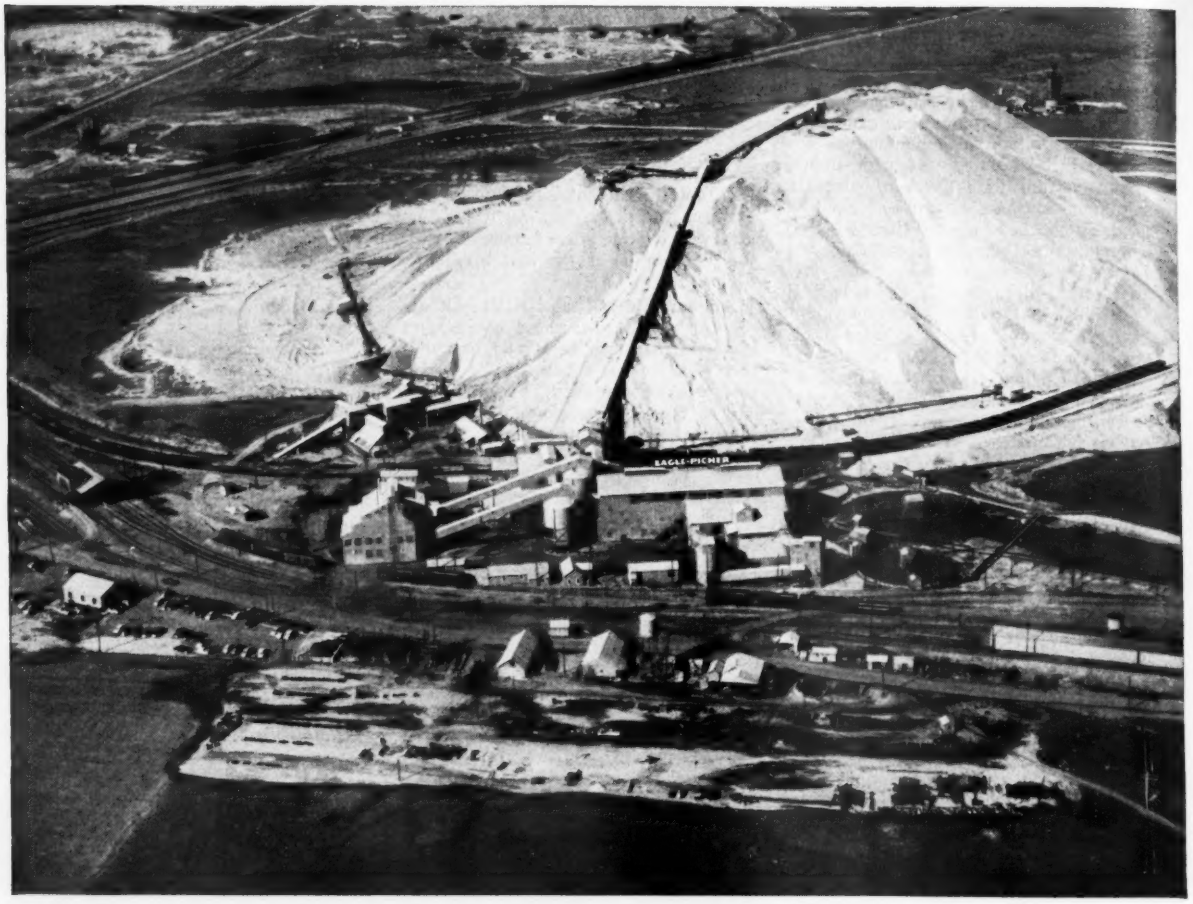
Skill is needed in determining when the test load and bolt tension are equal

Test For Shell Type Bolts

To determine the anchorage capacity of an expansion shell and plug, the required equipment consists of a hydraulic jack with attached load-indicating gage, a high strength test bolt with an extension and adapter to connect to the end of the bolt, and a displacement measuring device (same device as for wedge type bolt). It is recommended that this test not be combined with the plate-tapping test because of difficulties in interpreting the data.

The test procedure is as follows. The roof bolt is installed and tightened according to normal practice, and the torque measured with a torque wrench. The bolt is removed, leaving the shell and plug in place. The test bolt is inserted in the plug and the pulling equipment attached. With the displacement measuring device in position, load is gradually applied and the displacement measured for each load increment. Loading is continued until displacement occurs without load increase, which indicates that the anchorage capacity of the shell and plug has been reached. Fig. 1 shows the results of some tests in which the high strength bolt was used.

This test measures the holding power, or anchorage capacity, of the expansion shell and plug installed at a predetermined torque in a given type of roof rock. Use of the high strength test bolt makes it possible to measure anchorage capacities in excess of the ultimate strength of the regular mine roof bolt (up to the yield load of the high strength bolt). The test can, of course, be performed with the regular roof bolt, but in this case the anchorage strength cannot be determined if it exceeds the yield load of the bolt, which is about 12,000 lb minimum for a ¾-in. mild steel bolt.



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Millisecond-Delay Blasting Of Bench Rounds

High Speed Camera Helps Determine Optimum Delay Period For Detonators At USBM Oil Shale Mine

By FRED D. WRIGHT
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Bureau of Mines
College Park, Md.

AS a part of its Synthetic Liquid Fuels Program, the U. S. Department of the Interior, Bureau of Mines, operates an oil-shale mine near Rifle, Colo. Mining research activities were greatly curtailed in early 1951, but before then considerable research was conducted on many phases of mining. Among these was an investigation of millisecond-delay blasting. These investigations were conducted in the Experimental mine, which was developed to demonstrate commercial-scale operations by a room-and-pillar method in an approximately horizontal bed of oil shale 73 ft thick.

It is generally recognized, and there is ample evidence to support the view, that better fragmentation results when bench rounds are detonated by millisecond delays rather than by instantaneous or standard delays. It follows, therefore, that between the opposite extremes of simultaneous firing and long-delay firing, there should be an optimum delay period for blasting adjacent holes in a bench row. To determine whether this were the case, an experiment was conducted in cooperation with the Applied Physics Branch of the Bureau of Mines.

Test Conditions Described

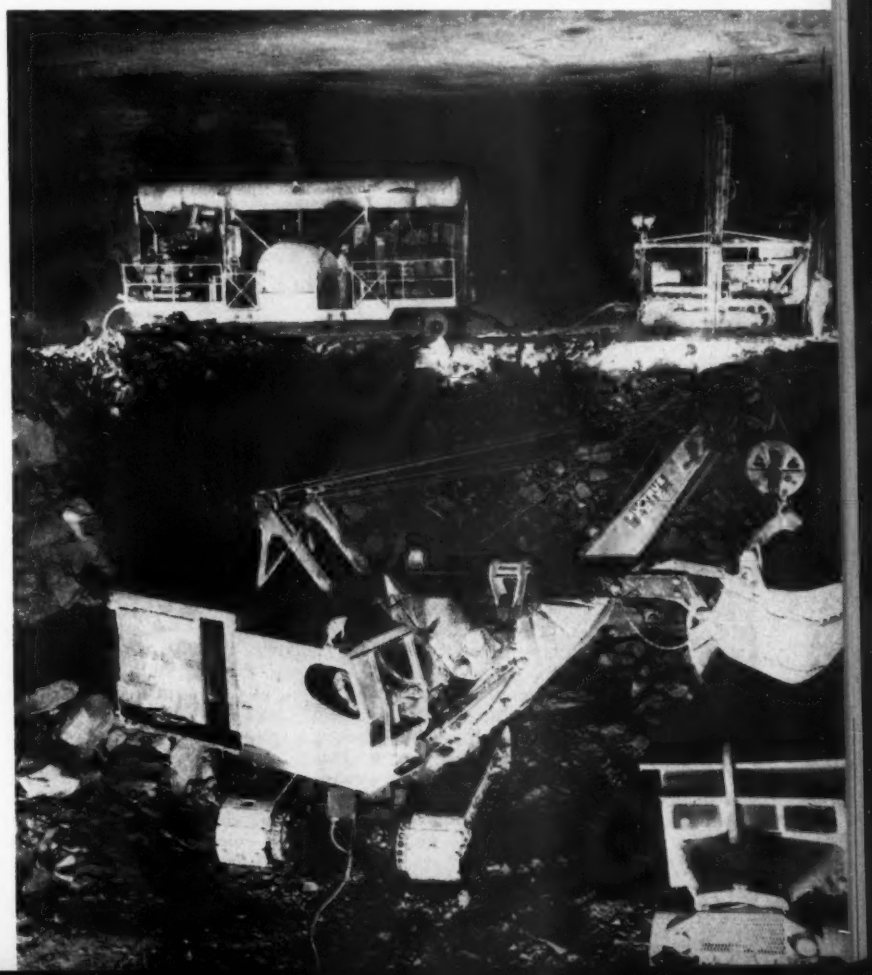
For each test eight vertical holes were drilled 23 ft deep to form a single bench row. Holes were two in. in diameter and spaced eight ft apart, with 6 2/3 ft of burden. They were charged with 45 percent semigelatin and primed with seismic-type instantaneous caps. The instantaneous caps were delay-fired by an accurate electrical firing device or timer developed by Obert[1] and Duvall[2]. Blast holes were fired at the chosen delay interval progressively from one end of the row to the other.

The first bench row was blasted with a 25-millisecond delay between successive holes. Two other rows were blasted with delay times of 12½ and 6¼ m.s. respectively, and the fourth row was blasted with no delay between holes.

Although no physical measurements of the fragmentation were made, the difference in the sizes of fragments resulting from the four tests was readily seen. Several large boulders were found in the muck piles of the 0- and 6¼-m.s. delay tests. Fragmentation in the 25-m.s. round was better, and no large boulders were present. However, the 12½-m.s. test was obviously the best, as the fragments were considerably finer than those made in any other test.

Millisecond detonators were tried also in V-cut rounds drilled 15 ft deep in headings 60 ft wide and 27 ft high. Thorough experimentation with standard delay detonators had proved that a minimum charge of 695 lb of 45 percent semigelatin was required in a 15-ft round to break approximately 1500 tons. With millisecond delays the full 1500 tons could be broken with only

Three-cubic yard shovel loads broken bench round underground at Rifle, Colo.



[1] Chief, Applied Physics Branch, Bureau of Mines, College Park, Md.
[2] Physicist, Applied Physics Branch, Bureau of Mines, College Park, Md.

Table 1.—*Timing of events for bench blast 1.*

Time, milliseconds	Remarks
0	Hole 1 detonated (instantaneous detonator) while shutter was closed. Smoke visible in following frame.
12	Hole 2 detonated (25-m.s. detonator). Flash visible.
35	First crack developing. This crack in front of hole 2.
43	Crack well developed, indicating appreciable movement.
50	Rock movement well under way in front of hole 1.
58	Hole 3 detonated (50-m.s. detonator). Flash visible.
66	Hole 4 detonated (75-m.s. detonator). Flash visible. Rock movement progressing from 1 to 4.
100	Complete face moving.

Table 2.—*Timing of events for bench blast 2.*

Time, milliseconds	Remarks
0	Timer charge detonated, Flash from hole 1 (Instant detonator) not yet visible.
7	Smoke from hole 1. Flash occurred when shutter was closed.
22	Hole 2 detonated (25-m.s. detonator). Flash visible. Cracks developing right, left, and bottom of hole 1.
30	Definite fracturing in front of hole 1.
38	Appreciable movement of face in front of hole 1.
61	Fracturing in front of hole 2.
77	Hole 3 detonated (50-m.s. detonator). Flash visible.

570 lbs of explosive. However, the muck piles from these rounds were 150 ft long compared to 70 ft from those of a standard delay round. The efficiency of loading with a 3-cu-yd electric shovel was greatly reduced, and the savings in dynamite were more than offset by the additional time required for loading. After all the available information on millisecond blasting was obtained and several different delay patterns had been tested with no success, it was decided that slow-motion moving pictures might aid in solving the problem.

Camera Aids Observation

A high-speed electrically operated movie camera capable of making 128 frames per second was obtained for the study. This camera was enclosed in a steel box and was operated from the blasting station by remote control.

Movies were taken of vertical blast holes breaking a bench face. All holes were 13 ft deep, with a 6¾-ft burden and an eight-ft spacing. They were charged to within 18 in. of their collars with 45 percent semigelatin. Before each test, the face to be broken was sprayed with flat white paint to improve the illumination afforded by photospot lights. The resulting improvement in picture clarity assisted in analysis of the film, since the rock fracturing could be noted more easily. As an aid to detection of the initial rock movement, 25 watt lights were attached to the face in front of the blast holes.

For the first test, the charges in four two-in.-diameter holes were detonated with instant 25-, 50-, and 75-m.s. delay exploders, respectively. To indicate the beginning of the blast sequence, one stick of dynamite with an instant detonator was placed in the collar of hole 1. The flash from this charge was used as zero time. Time intervals were calculated on the basis of 128 frames per second or 7.8 m.s. per frame. In each frame, the shutter was open 4.7 m.s. and closed 3.1 m.s. Table 1 summarizes the timing of events.

The next test (Table 2) consisted of three holes detonated by Instant, 25-m.s., and 50-m.s. detonators.

A small charge of dynamite placed next to a small light bulb and detonated by an instant cap was used as the zero-time indicator.

In both these tests, wide variance was noted in the actual detonation time as compared to the rated time of the detonators. The final test consisted of blasting three two-in.-diameter holes. In this test all holes were stemmed with dry sand and detonated with instantaneous detonators.

Table 3.—*Timing of events for bench blast 3.*

Time Milliseconds	Remarks
0	Flash from timer charge. No flashes from any test holes.
8	Initial cracks developing.
15	Movement of face beginning.
23	Rock movement well under way.

In test 3 about 15 m.s. elapsed before rock movement was noticeable, whereas in tests 1 and 2 rock movement did not begin until 30 to 40 m.s. after detonation. Apparently simultaneous detonation of all the holes in test 3 caused earlier movement of the rock.

What Happened

The following concept of what occurs after detonation of a round of blast holes is based largely on the preceding experiments.

Detonation of the explosive in a blast hole initiates an elastic shock wave in the rock. Other experiments have shown that, in the immediate vicinity of the hole, this elastic wave is essentially a single compression pulsation. When this wave hits the nearest free surface it is reflected as a tension wave. This reflected tension wave probably is more effective in cracking rock near the blast hole than the original compression wave. Because blast holes are generally within a few feet of a free surface, the elastic wave, which travels many thousands of feet per second, can crack the rock in the immediate vicinity of a blast hole within a millisecond or so.

The movies proved that, after detonation of a blast hole, considerable time passes before the rock begins to move appreciably. During this time the gas pushes on the rock, opens cracks, and begins to escape from the borehole and the cracks. However, when several holes in a single row are fired simultaneously, much of the gas escaping from cracks of one hole will be hindered by gas issuing from an adjacent hole. As a result, high gas pressure is maintained longer than when a single hole is detonated, and the gases from adjacent holes produce a cumulative effect in breaking and throwing the rock. When adjacent holes are fired with closely spaced millisecond-delay caps, the gases from adjacent holes similarly help break and throw the rock. The time interval between detonations of millisecond caps is important; the shorter the time interval, the greater the interaction of the gases in adjacent holes.

When all the holes in a single bench row are fired simultaneously, large shock waves are produced, and at many quarries this is a disadvantage. Furthermore, experiments indicate that better fragmentation results when the holes are fired with closely spaced millisecond detonators. Under these conditions it appears that the gases still interact almost as effectively to maintain high pressure for the maximum possible time and that the rock in front of the various holes begins to move at slightly different times, creating a shearing action that causes better fragmentation. Another explanation of the better fragmentation may be that, when two or more holes are detonated within milliseconds of each other, the impact of the second charge hits the rock while it is still under stress and for some reason now unknown—possibly the overlapping of the stress patterns—the rock is broken more thoroughly.

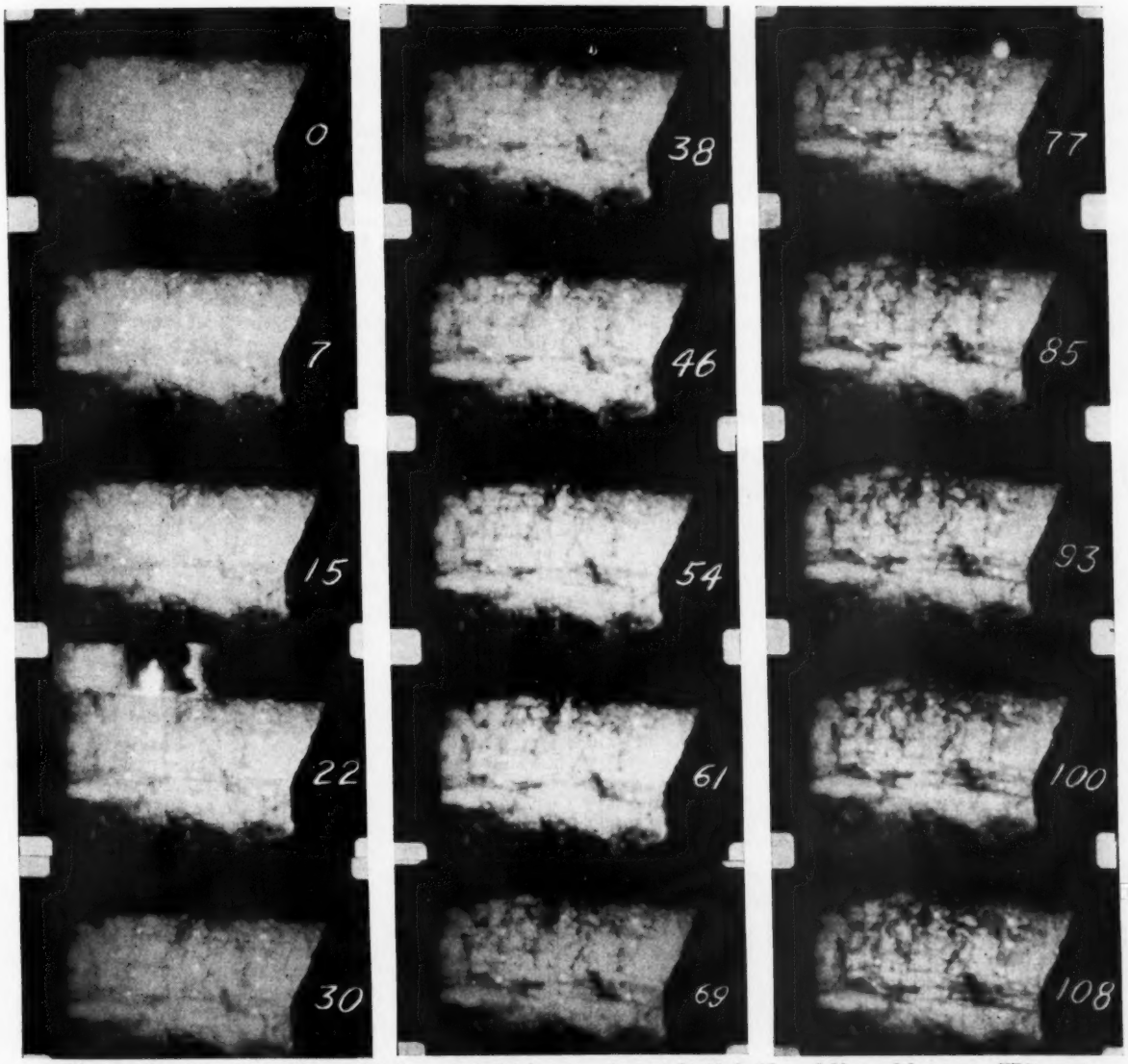
Timing Important

Indications are that, under the conditions of blasting at Rifle, a delay of about 12 m.s. between adjacent holes of a single bench row gives the best results. Such a delay can be obtained readily with an electric timer but not with commercial caps because the variation in the firing times of any one period of commercial millisecond detonators generally exceeds 12 m.s. Thus a cap rated to fire in 100 m.s. may actually fire in 80 or in 120 m.s. When use of an electric timer is impractical, detonation of all holes within a single row with caps of the same delay period seems to offer the best probability of attaining nearly optimum delay periods to produce maximum fragmentation and breakage with the least amount of dynamite. Of course there is the possibility that adjacent holes will fire at exactly the same time and produce some large boulders, but experience with heading and bench rounds indicates that this seldom happens. Using standard delay caps of the same period in a single row will not give equal results because the variation in their actual firing times is much greater than that of millisecond delays. Thus the probability that six standard No. 5 delays would fire approximately 12 m.s. apart is extremely remote. In fact, there is such a variation in standard delays that generally the result is more like blasting the holes one at a time than blasting them almost simultaneously.

Minimum Delay Period Best

The motion pictures of bench blasts proved that an appreciable time passes before the rock actually begins to move. They also indicated that if more than one row were fired, a delay of about 100 m.s. should be allowed between successive rows to insure that the rock from the first row had moved enough to unburden the next row. Unless at least this amount of delay were allowed between detonation of successive rows, the burden on the last row

(*Continued on page* 108)



Photographs of bench blast 2 in which three vertical holes were detonated with 0-, 25-, and 50-m.s. delay caps. White spot in upper left corner of the first two frames is the zero-time indicator. The other white dots are small electric lights attached to the face in front of the three holes. See table II for a description of the sequence of events. Time in milliseconds after detonation of the 0-delay cap

L. C. Campbell, Chairman of the Coal Division; R. E. Salvati, Chairman of the Program Committee, and John P. Courtright, Chairman of the Manufacturers Division, discussed the AMC Coal Show during luncheon

Coal Show Huge Success

Attendance Exceeds Expectations as Coal Miners View Most Powerful Array of Cost-Cutting Machinery and Supplies Ever Assembled

DURING the four days from May 11 to May 14, some 13,000 mining men registered at Cleveland's Public Auditorium. The attraction was the American Mining Congress' 1953 Coal Convention and Exposition. To this year's convention-goer, the primary purpose of attending the Coal Show was the serious business of finding out, at first hand, all about the latest, most efficient methods and machinery. Manufacturers and suppliers displayed their newest devices and improved models of standard equipment. Leading operators recounted their experiences and experiments with labor and time-saving methods and machines.

Theme of the whole show was expressed by the *Wall Street Journal* in the headline "More Mechanization as Escape from Tightening Wage-Price Squeeze."

Sessions Well Attended

From the first Convention session on Monday morning, to the last sessions on Thursday, speaker after speaker told how improved methods have helped get more out of old machines and how new methods and machines have helped pare down operating costs in deep and strip mining operations and in surface preparation plants.

Attendance at all sessions—morning and afternoon alike—was especially strong. Not only did large numbers of mining men turn out, but the questions and comments they offered during the discussion periods and after the sessions were over, showed how vitally interested they were in the operating, economic and personnel problems facing the entire coal mining industry.

The interest shown in every paper on the nine-session program illustrated how well the National Program Committee, headed by R. E. Salvati, president, Island Creek Coal Co., had taken the pulse of the industry in planning the entire Convention Program. Session and panel chairmen did an excellent job in conducting their respective sections of the program. Robert G. Pfahler, chairman of the Floor Committee and his committee members were extremely helpful in seeing that each session began and remained on schedule.

C. E. Hugus and his Welcoming Committee were on hand to see that all visitors were made to feel at home and that there were no hitches in carrying out the streamlined registration procedure.

Abstracts of Convention papers appear on pages 65 to 85 of this issue of the JOURNAL and the entire proceedings of the convention will be published in 1953 *Coal Mine Modernization* due off the press late this summer.

Land Use Committees Meet

Taking advantage of the presence in Cleveland of a number of committee members in connection with the Coal Show, the Land Use Committees of the American Mining Congress and the National Coal Association met in joint session under the co-chairmanship of R. L. Ireland, chairman of the Executive Committee, Pittsburgh Consolidation Coal Co., and L. R. Kelce, president, Sinclair Coal Co.

Chairman Ireland welcomed the committee members to Cleveland and stressed the importance of cooperation between industry committees toward solution of problems involving land use and air on stream pollution. He called on Julian Conover for a report on the status of Federal legislation dealing with these topics.

Conover reported on five measures pending in the House of Representatives to permit accelerated amortization of plants to eliminate stream pollution and discussed several bills dealing with proposed air pollution and smog studies. He also referred to the D'Ewart-Dworshak bill and the Regan bill, which would make certain amendments to the mining laws that are in effect in the public land states of the West. His report was followed by a discussion, during which attention was given likewise to the Eberharter bill dealing with "backfilling" tax deductions.

Stream pollution problems and cooperation in the work of the Ohio River Valley Water Sanitary Commission were discussed by Henry Hebley, L. E. Sawyer and Larry Cook.

It was decided that, in view of the wide scope of the activities of the committees, they would henceforth be known as the AMC Land and Water Use Committee, the AMC Land and Water Use Technical Committee, the NCA Land and Water Use Committee and the NCA Land and Water Use Advisory Committee.

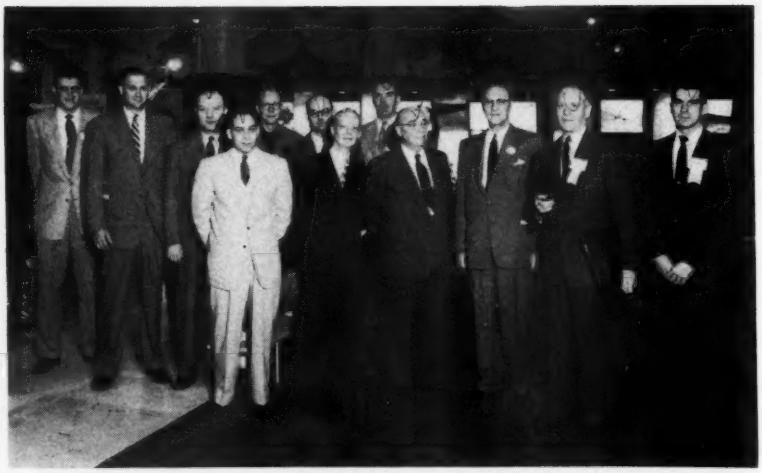
Land and Water Use Committees held a business meeting after lunch on Wednesday

Biggest Exposition Ever

Occupying 11 percent more space than the previous record-breaking exposition two years ago, the 1953 Coal Show included more than 260 exhibiting companies in the six exhibition halls of the Cleveland Public Auditorium, with outdoor displays on the Mall to the west of the main building and on the lakefront. Included among the exhibits were improved continuous type mining machines, extensible conveyors to help make these machines more nearly continuous in operation; loading machines, shuttle cars, drills for deep and strip mine blastholes and for bolthole drilling, roof jacks and timber jacks, huge railroad-car-sized coal and overburden haulers, giant earth-moving machinery, operating models of coal and stripping shovels, electrical equipment, roof bolts, compressors, electric locomotives, and diesel locomotives, storage batteries, blasting supplies, safety devices, preparation plant equipment, including cyclones, shaking tables, heavy media separation systems, water treatment devices, and all the thousand and one other advances in coal mining preparation and safety equipment that have contributed to lower-cost coal production and will continue to play so important a part in the future.

A notable feature of this Coal Show was the keen interest taken in the exhibits by the many metal and non-

Registrants filed through the lobby into the exhibit halls in a steady stream



The Show Committee toured the exhibit halls on Sunday before the show opened and found all in order

metallic mineral mining men who attended. They have found that much of the equipment and supplies on display has direct application in their own fields. The registration lists at each succeeding Coal Show include greater numbers of forward looking men from these other branches of the mining industry.

This was the greatest show to date. Members of the Manufacturers Division and all exhibiting non-members have every right to be proud of the 1953 Exposition. The information and ideas mining men carried away from this Coal Show will be the operating realities of tomorrow.

New Generator Operates

Most underground coal mining machinery is designed to operate on direct current. Heretofore the dc facilities at the Cleveland Auditorium have not been able to supply sufficient current

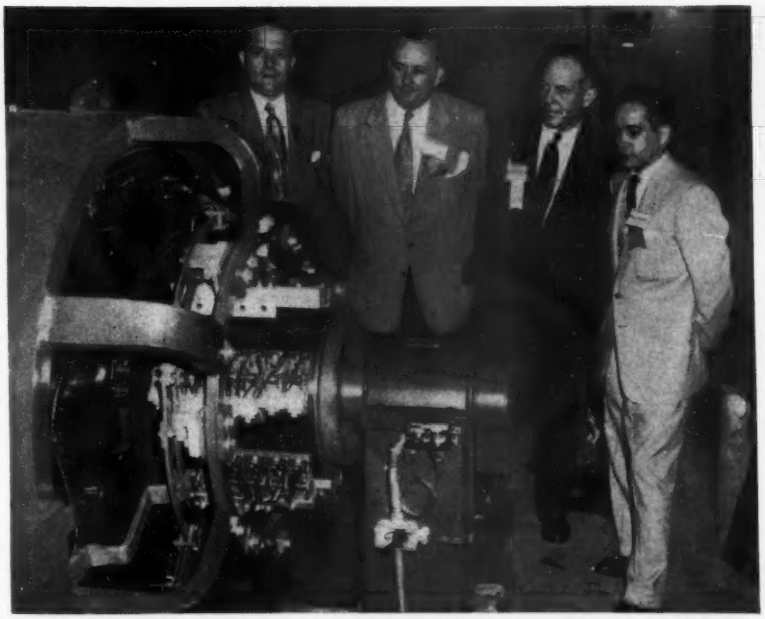
One of the six exhibit halls in Cleveland's Public Auditorium

to allow operation of many of the units displayed. Subsequent to the 1951 Coal Convention and Exposition, at the instigation of the American Mining Congress, a 500 kw motor-generator set has been installed as a permanent addition to the Auditorium's facilities. Costs were defrayed by joint contributions of the American Mining Congress, the City of Cleveland, The Reliance Electric and Engineering Co. and the Cleveland Convention Bureau.

At a luncheon held on Tuesday in the South Hall of the Auditorium, the Mayor of Cleveland, members of the City Council and other leading City officials were guests of the American Mining Congress. Julian Conover, executive vice-president of the organization, presided. In welcoming the officials he said that a large part of the Show's success was due to their own fine cooperation and to that of the citizens of Cleveland. He commented particularly on the fine facilities and service of the Cleveland Public Auditorium, which have now been augmented by the new motor generator set.

Conover then introduced Howard I. Young, president of the American Mining Congress; R. E. Salvati, chairman of the Program Committee; John P. Courtright, chairman of the AMC Manufacturers Division, and L. C. Campbell, chairman of the Coal Division, each of whom spoke briefly, pointing out the vital importance of the mining industry in the economy of the country, and added his own words of appreciation to those already expressed.

Speaking for the City of Cleveland



New 500 kw motor-generator set is inspected by Edward E. Helm, vice-president, Reliance Electric and Engineering Co.; Edward C. Brennan, executive vice-president, Cleveland Convention and Trade Show Bureau; Julian D. Conover, executive vice-president, American Mining Congress, and Paul Hurd, Commissioner, Cleveland Public Auditorium and Stadium

Cleveland's City Fathers met officials of American Mining Congress at lunch on Tuesday. Later they toured the exhibits

Manufacturers Division meeting was well attended

in behalf of Mayor Burke, F. R. Hanrahan, director, Department of Finance, spoke of the pleasure Cleveland and Clevelanders derived from playing host to the mining men and manufacturers. Edward C. Brennan, executive vice-president of the Cleveland Convention and Trade Show Bureau, added the information that the profit to the City and people of Cleveland from the Coal Show, amounts to an estimated $3,000,000. Paul Hurd, commissioner of the Cleveland Auditorium and Stadium, briefed the councilmen and ladies on the exposition. Following this, the party broke up into small groups for a tour through the exhibit halls.

Relaxation *a la mode*

It has been said that the 1953 conventioneer was a serious fellow intent on getting the most out of his visit to convention sessions and exposition halls. He, and his lady, also demonstrated their ability to change pace by enjoying every minute of the splendid entertainment program.

There was the thrilling pitchers' battle between the Cleveland Indians and the Chicago White Sox on Monday night. Cleveland lost 2 to 1 even after a home run by Bobby Avila into the left field stands in the 6th inning, but the final score was in doubt right up until the last minute of the ninth inning.

On Tuesday night the Coal Miners party was held in two sections at the Carter and Statler Hotels. Those who attended at either place were unanimous in their praise of the food, the fun and the music. It was a tossup whether the Five Guardsmen, a quintet of male singers, the juggler and his cute "grandmother", the lady who started to sing grand opera and ended up by roller skating across the floor, or the zany antics of the Four Woodsons, were the favorites of the evening. The eight dancing beauties of the line came in for a full share of applause with their unusual lighting effects and graceful gyrations. Jack Herbert, who "MC'd" the Statler party, was also a favorite with his running fire of topical stories and skilled sleight-of-hand routine.

With no formal entertainment plans scheduled, Wednesday night was Friendship Night. This was the time when old friends got together for a quiet evening of rest or a room-hopping expedition. Every hotel had its quota of hospitable retreats, where old acquaintances and new gathered for off-the-job gossip, swapped reminiscences, sang a few songs and just had a plain, old-fashioned, good time.

Climax of Convention Week was the King Coal Theatre on Thursday night. Mining men and their ladies trooped to the Auditorium's Music Hall, where a stellar cast, including Ray Middleton of "Oklahoma" and "Annie Get Your Gun" fame, Guen Omeron, Kirsten Kenyon, Ray Mason and Norval Campbell with a suporting group of 50

Part of the 13,000 who attended the 1953 AMC Coal Show

musicians and the Choralaires, interpreted the songs of Stephen Foster and the music from many of Sigmund Romberg's Operettas.

Everyone was sorry when, to the strains of Auf Wiedersehen, the final curtain rang down marking the end of another outstanding Coal Convention and Exposition.

Ladies Program a Success

If strange sounds emanate from telephones anywhere in the coal mining regions of the country in the near future, it may be one of the ladies who attended the Welcoming Luncheon at the Coal Show, doing her "homework." Lucille La Chapelle delighted her audience with her lecture on "You are better than you sound." By letting us hear ourselves as others hear us and then demonstrating corrective measures, Miss La Chapelle carries on a one-woman crusade for better speech.

Wednesday's bus trip to the Cleveland Art Museum was also a great success. The art treasures of the museum and the May Show of Arts and Crafts were a rewarding prelude to a tea at the museum, for the ladies who were lucky enough to get tickets.

For the large number who attended the luncheon and style show on Thursday, the Higbee Co. of Cleveland put on an exciting show displaying the latest in summer fashions.

The ladies were also much in evidence at the evening events and many came to the exposition halls to see the displays of the machinery and equipment that make the mines go.

It's Cincinnati in 1954

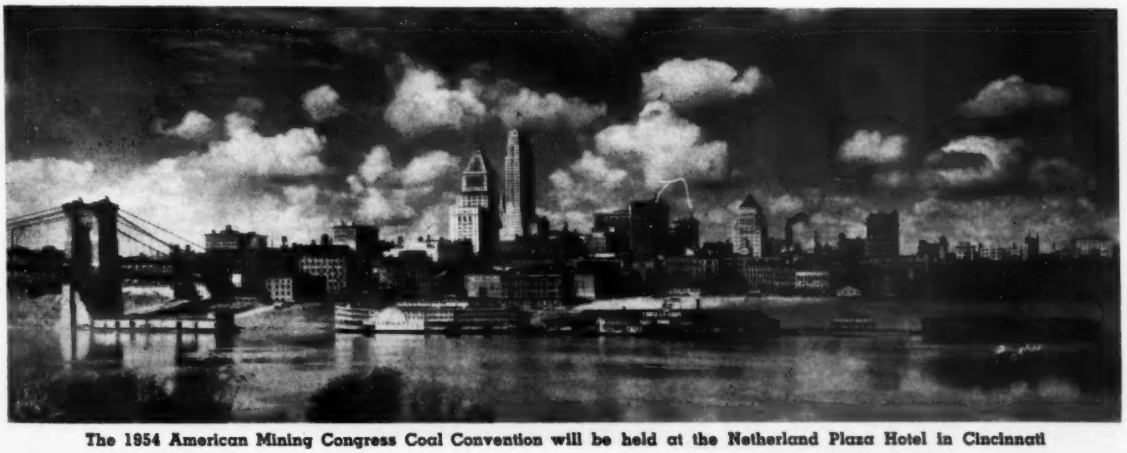
Those who had the misfortune to miss the 1953 Coal Convention and Exposition can look forward to joining their fellow mining men and ladies at the American Mining Congress 1954 Coal Convention in Cincinnati May 3-5. As is the custom, this meeting will be devoted to the operating and technical advances made during the year and to outlining plans for the future. There will be no exposition in 1954. The next Coal Show is scheduled for Cleveland again in 1955.

All those planning to attend the 1954 Coal Convention in Cincinnati should make early hotel reservations.

The entire cast sings Auf Wiedersehen, the closing number of the King Coal Theatre

Every lady present enjoyed the special programs designed for them

The 1953 Coal Show is over, but the industry that made this the "greatest show on earth" will continue to progress and produce to supply more of the energy and chemical raw materials so vital to America's evergrowing economy.



The 1954 American Mining Congress Coal Convention will be held at the Netherland Plaza Hotel in Cincinnati

TO HELP SELL COAL...

BCI Advertises to the Industrial, Commercial and Institutional Markets

Each month, full-page messages like the one shown below—featuring either "off-track" or "on-track" installations—appear in the pages of *Business Week, Nation's Business* and a carefully selected group of power journals and trade magazines.

"BURNING COAL THE MODERN WAY CUT OUR POWER COSTS $51,000 A YEAR!"

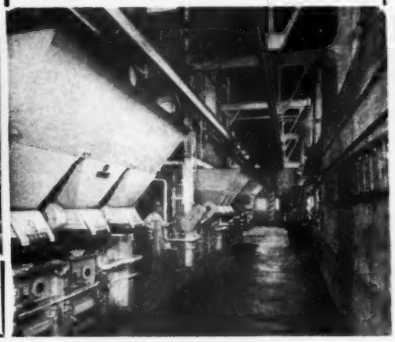
"Up-to-date coal installation cut fuel consumption 20.3% ... labor force 47%!"

says Mr. George E. Bennett, Supt. Motive Power, Chicago & Eastern Illinois Railroad.

"We recently modernized the power plant at our Oaklawn Shops in Danville, Illinois. The savings we've realized in labor and fuel proved to us you can't beat *bituminous* coal burned with modern equipment."

Here's the new power plant of the C&EI Railroad's Oaklawn Shops at Danville, Illinois. By burning coal the modern way this plant saves a total of $51,180 a year—*will pay for itself in less than seven years.*

This is a view of the firing aisle showing the spreader stokers which are fed by a weigh larry. Three new boilers now do the work that formerly required seven. Man-days per week required to operate the plant have been reduced from 112 to 59!



● Low price—dependable supply—safe storage—coal gives you all these no matter how you burn it.

But you can get much more!

Get more steam for every dollar—burn coal in a *modern* combustion installation. Cut your labor costs—install automatic coal and ash handling equipment. If you call in a consulting engineer—he can show you how coal can do a better job for you with equipment designed to meet your *specific* needs.

Of all the fuels, coal alone has virtually inexhaustible reserves. And to supply this coal, America has the world's most productive and efficient coal industry. That's why you can count on coal for dependable supply, relatively more stable prices—now—and in the future, too!

If you operate a steam plant, you can't afford to ignore these facts!

COAL in most places is today's lowest cost fuel.

COAL resources in America are adequate for all needs—for hundreds of years to come.

COAL production in the U.S.A. is highly mechanized and by far the most efficient in the world.

COAL prices will therefore remain the most stable of all fuels.

COAL is the safest fuel to store and use.

COAL is the fuel that industry counts on more and more—for with modern combustion and handling equipment, the inherent advantages of well-prepared coal net even bigger savings.

BITUMINOUS COAL INSTITUTE

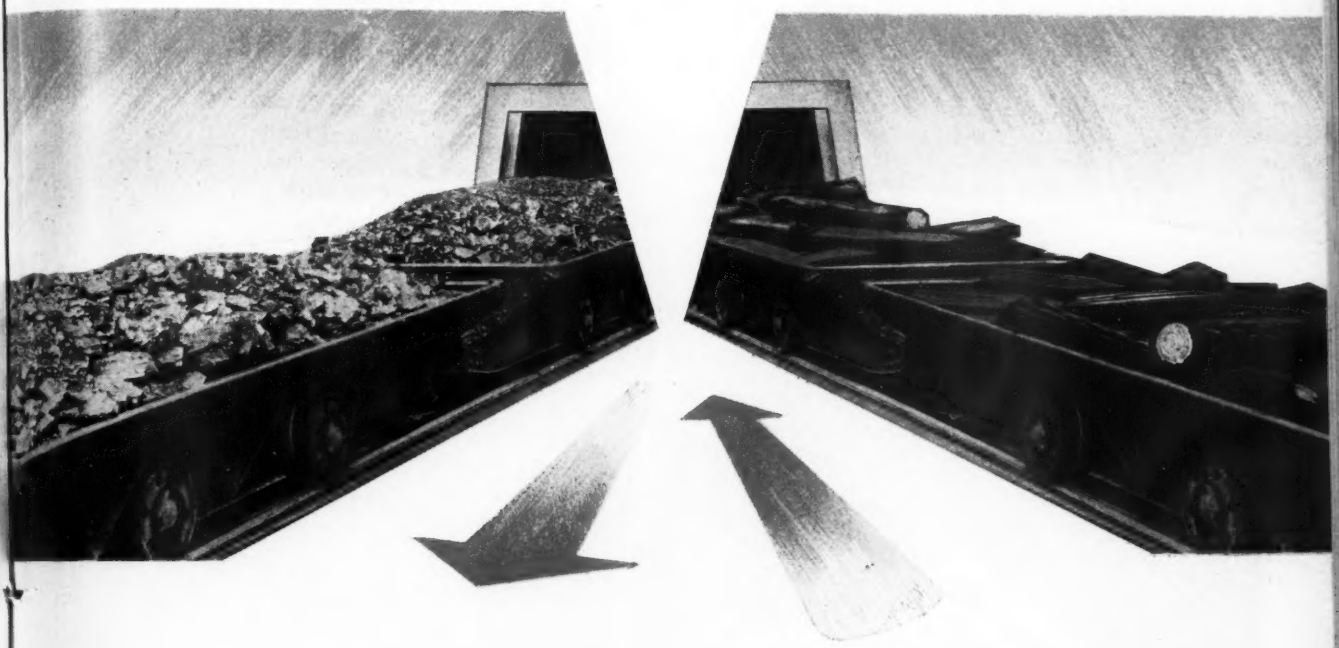
A Department of National Coal Association, Washington, D.C.

FOR HIGH EFFICIENCY ... FOR LOW COST

YOU CAN COUNT ON COAL!

the case of the

SPLIT PERSONALITY



Sometimes split personalities pay off by letting you do twice as much work. It's that way with a.c.f. Mine Cars. They work twice as hard. *Going in,* they transport men and supplies cheaply and safely . . . *coming out* they haul record loads in record time.

Because any damaged car can be quickly shunted out of line and repaired on the spot, without interrupting production for more than a few moments . . . costly transportation shutdowns are entirely prevented.

At the dumping point, the special a.c.f. Drop Bottom design permits automatic unloading at a rate of a ton per second. Compare this for cost cutting and increased production with the unloading speed of ordinary cars which require minutes of time per ton.

If minor repairs can stop your transportation system cold, you've got a major problem keeping production at a consistently high level. That's why so many mine operators prefer a.c.f. Mine Cars. Get all the facts yourself from your nearby a.c.f. Representative. American Car and Foundry Company, New York • Chicago • St. Louis • Cleveland • Philadelphia • Huntington, W. Va. • San Francisco • Washington • Berwick, Pa.

a.c.f. MINE CARS

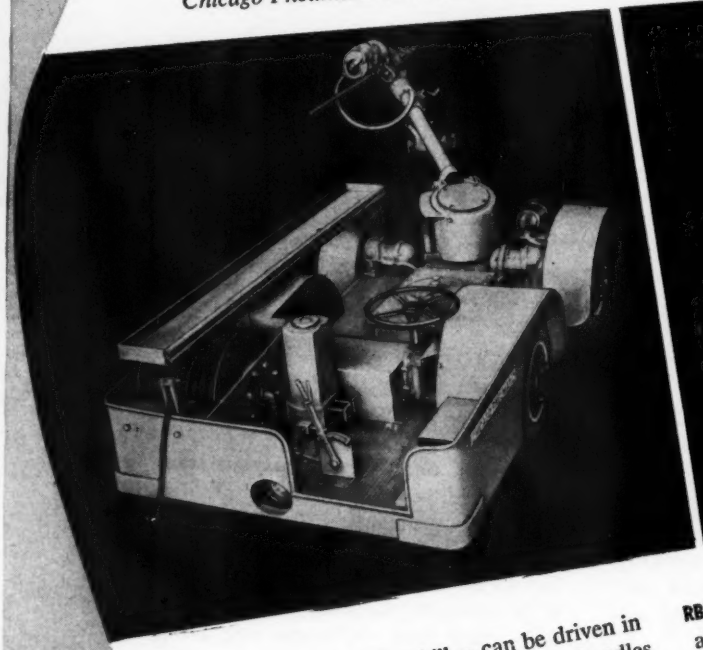
for Constant Haulage

Bring out the best

IN YOUR MINE

Wherever you find outstanding safety and economy records you'll find Chicago Pneumatic equipment. That's why CP's Mobile Permissible Roof Bolting Units . . . Single and Double-arm Permissible Tramdrills . . . Roof Bolt Stopers and Impact Wrenches . . . Hand-held and post-mounted Permissible Coal Drills . . . and many other pneumatic and electric tools for faster, safer, more efficient mine operation and maintenance are specified by operators everywhere.

Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17. N. Y



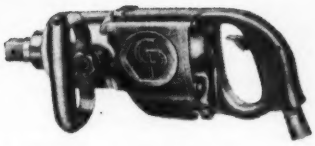
CP Permissible Tramdrill — can be driven in seams as low as thirty inches — handles easily in narrow working areas. Drills shot holes in coal up to 4½" in diameter within four inches of roof or bottom—and at any angle! CP Tramdrills are all-electric — drill arm controls are within easy reach of operator. Available for single or double arm operation.

RBD Permissible Mobile Roof Bolting Unit — all electric and easy to operate under any condition. Completes entire bolting cycle in 3 minutes flat — auger and bolt setter are driven by same motor. Telescopic chuck has 10 inch auger adjustment to conform to roof irregularities. Unit is equally efficient in high coal as well as low seams.

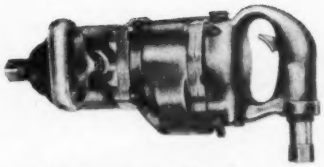
Write CP for complete information!

CP-574 Permissible Post-Mounted Coal Drill has drilling speeds up to 40 inches a minute — can drill 40 to 60 holes per shift.

CP-572 Permissible Hand-Held Coal Drill — weighs only 43 pounds — is a real work horse — has safety clutch for automatic release if auger sticks, protecting both operator and motor.



CP-3630 Air Impact Wrench, capacity to ¾" bolt size.



CP-365 Air Impact Wrench, capacity to 1¼" bolt size.

CP-134 Roof Bolt Stoper.

For Speedy Roof Bolting In The Harder Veins — a CP Short Stoper and CP Air Impact Wrench form a perfect team for drilling bolt holes and running and reclaiming roof bolts. The CP-134 Short Stoper is available in four models designed to handle steel changes of 12", 18", 24" and 36". The "in line" feed thrust of the twin feed cylinders reduces binding, lengthens bit life, increases drilling speed. A rotation release permits driving wedge-type bolts. Available in wet or dry types.

Chicago Pneumatic

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

Fishes profits out of coal washery waste water . . . *with help of TIMKEN® bearings*

THE EIMCO CORPORATION mounts main drive worm gear shaft on Timken bearings, insuring least possible maintenance, long life.

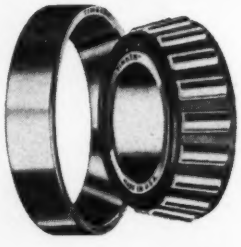
THE fines washed out of coal during processing—once considered too costly to recover—are turned into highly saleable "cake" by these Eimco filters. The installation shown is at the world's largest coal washing plant, a Jones & Laughlin operation.

Keeping the big collector discs constantly turning is a single worm gear drive, mounted on Timken® bearings. These bearings carry not only radial load, but the heavy thrust load of the worm as well. With Timken bearings' *tapered* design, no extra thrust bearings are required.

On this machine, Timken bearings are a sort of extra life insurance for the worm and worm gear. They hold the worm gear in precise and rigid alignment to assure accurate meshing. This, of course, minimizes gear wear, and helps save on maintenance.

Timken bearings themselves — because they're made of special alloy steels, manufactured with highest precision and finished to an incredible smoothness—normally last the life of the machinery they're installed in. Look for the trade-mark "Timken" on the bearings of any mining machinery you buy. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



TIMKEN

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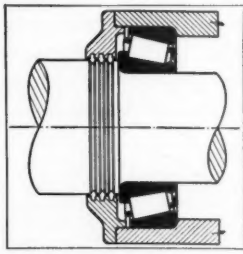
TAPERED ROLLER BEARINGS



LUBRICANT STAYS IN —DIRT KEPT OUT

Because Timken bearings hold shafts concentric with housings, closures are made more effective. Lubricant is retained, dirt and moisture kept out.

The Timken Roller Bearing Company is the acknowledged leader in: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. special analysis Timken steels.

NOT JUST A BALL ◯ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ↓ AND THRUST →◯← LOADS OR ANY COMBINATION →◯←

Convention Papers

Abstracts of papers presented at Convention Sessions are given in the following pages. The full text of each, together with discussions and illustrations, will be published in "Coal Mine Modernization—1953."

ROOF BOLTING

Increasing Coal Reserves Through Roof Bolting

By E. R. COOPER
General Manager of Coal Mines
Jones and Laughlin Steel Corp.

JONES and Laughlin's Vesta coal properties extend some 15 miles west from the Monongahela River in Washington County, Pa. As the workings drive westward, the roof has become more and more difficult to control. In 1948, a set of eight main face headings driving in Vesta No. 4 Mine entered an area having a roof structure so difficult to handle that Management was close to abandoning the section entirely. Under the conditions then existing, and with the roof support methods then in use, the coal was not only *economically* unmineable but also was near the point of being *not mineable at all.*

Early in 1949 it was decided to try roof bolting on an experimental basis. The program was so successful that roof bolting of all working places on cycle was begun several months later. No falls occurred within bolted working areas after that time. Production was increased and the unit moved from lowest rank at the mine to a place among the leaders.

Since 1949, over 1,000,000 tons of coal have been produced under roof bolts at the Vesta Mines from this and other sections and there are about 60 miles of roof bolted entries. The few failures which have occurred involved only about 350 ft of entry in the entire project. On this basis, the record indicates that the roof bolting program has been 99.9 percent effective.

An interesting corollary to the success of roof bolting is its effectiveness in controlling the manner in which methane is liberated. Prior to roof bolting, the entry section described in this paper was brought to a complete stop several times by heavy feeders of explosive gas which could not be diluted to legal requirements by the most extreme methods of bratticing. By the time roof bolting became routine, methane troubles had largely disappeared. Apparently, wherever roof bolt holes are drilled, methane is freed outby the face in such a way that the ventilating current provided by normal brattice can sweep the gas away without much danger of an accumulation forming at the face.

The presence of large quantities of methane in the immediate roof structure undoubtedly contributed in some degree to the bad roof conditions. However, when this gas pressure was relieved by systematically drilling roof holes in which no bolts were set it was still impossible to hold the roof with timber. The bolts gave control of the roof. Without them, this particular section and other large portions of the Vesta Mines could not be worked.

Experience and the Results of Roof Bolting

By J. C. HUNTER
Manager
The Powellton Coal Co.

THE Jane Ann No. 4 mine of the Powellton Coal Co. began operations in January 1949. Before beginning operations, it was determined by numerous core drills and crop openings that immediately over the seam there was 10 to 24 in. of definite hard draw slate, which did not cleave to the main roof. There was no positive way of determining before mining began, just what the characteristic action of this draw slate would be.

One loading machine unit was started in the main headings. Immediately the draw slate came down and gave trouble. It was believed that as the workings approached the center of the mountain, better top conditions could be expected. But, as the headings advanced, the draw slate continued to come with the coal. All of this slate had to be removed with the mobile loading equipment as the coal was loaded out. After the headings had advanced quite a distance without any improvement in the roof conditions, the company was considering abandoning the mine as unworkable.

Almost in desperation roof bolting was tried in early

April 1949, in an air course that had 12 in. of draw slate coming down when the coal was shot. This draw slate was supported by roof bolts, 24 in. long, spaced on 4-ft centers. When the bolting had continued for a distance of 120 ft with very satisfactory results, it was started in another parallel entry. After the roof in these two places had been supported on bolts for a distance of 200 ft, the experiment was gradually extended to the remainder of the working section.

Equipment for the first experiment was make-shift. The next step in the program was to drill the bolt holes with a Jeffrey A-7 coal drill, using Kennametal bits. However, the problem of dust control presented itself. The workmen were then provided with respirators but the ordinary type of respirator was not satisfactory for this work. A preliminary test showed the dust could be effectively wetted down with a very small quantity of water. In the meantime, stoper drills came on the scene and were put in service effectively. New problems presented themselves as the program developed. There was a need for larger compressors; for a supply of water to allay the dust from the stopers, for a portable means of conveying the equipment from place to place and for a proper type of jack-bit.

One of the first improvements was the use of a Schramm compressor, now the standard unit in the roof bolting program, having a capacity of 217 cu ft. It is mounted on a flat-boat type skid, so it can quickly and easily be changed out for repairs. Water is carried on drilling units by two 60 gal, ordinary household hot water tanks mounted on caterpillar trucks. These tanks are fastened directly over the treads by means of straps, for easy removal in case of damage. Water is supplied to the portable tanks from a track mounted water car with a 1000-gal capacity.

At first, roof bolts were assembled in the mine at the working sections. This resulted in too many pieces being lost, both in transport and storage; moreover this method of assembly was costly since higher priced labor was required to do the work. Space was provided in a building on the surface and provisions were made for two men to assemble the bolts so they are ready for use when they reach the working section of the mine.

In the four years that this mine has been in operation, it has had an average daily production of approximately 1600 tons, all of which comes from working places where the roof is supported on bolts. During this time, nearly 270,000 bolts have been installed. Though the mine is still on development, nearly 50 linear miles of entry are supported on roof bolts. It is definitely proven that roof bolting has materially improved safety conditions in this mine and changed it to an efficient operation.

Utilization of Roof Bolting Equipment

By **HERMAN E. KNIGHT**
Division Engineer
Bell & Zoller Coal Co.

BELL and Zoller operates two mines in Western Kentucky and three in Illinois. The roof strata at these mines varies from a soft shale or siltstone at Zeigler No. 3 in Illinois to the hard-dense Providence Limestone at the Oriole mine in Kentucky. The Buckhorn and Murdock mines in Illinois and the Moss Hill mine in Kentucky have roofs of shale of a hardness between these extremes.

Roof material at Zeigler No. 3 mine in the No. 6 Seam is such that it is questionable whether the mine could be operated economically without roof bolting. It was impossible to carry on the normal cycle of cutting, breaking and loading without excessive delays while using conventional timbering. The immediate roof consists of 28 ft of soft, weak shale which disintegrates rapidly when wet. There are numerous faults, joints, and clay veins and the presence of water has made roof support a major problem.

Oriole mine in Western Kentucky is in No. 11 coal, which has an average thickness of 6 ft with cover ranging from 100 to 400 ft. The shale or "gob" immediately overlying the coal has very little inherent strength. Unless bolted or timbered it usually falls a short time after the coal is extracted. Immediately above the shale is a dense grey limestone. There are local areas of non-deposition or erosion where the No. 12 coal is immediately above the No. 11 coal, and overlying "gob." This condition makes for a very difficult roof support problem. Fortunately, these areas are not frequent.

At Zeigler No. 3 Mine in Illinois the result of the experiments and practical knowledge gained by observation of falls for two years brought about a decision to use two 5 ft-¾ in. diameter bolts in the entries for each 4 ft of advance. Theoretically, this would be one bolt for about 9 tons of coal. Since the immediate roof has very little strength in shear or bending, it would probably break between bolts if only conventional 8 by 8 by ⅜-in. bearing plates were used. These facts prompted a decision to place one 1½ by 7 by 66 in. oak board between the bolts, this board to be held in place by two 8 by 8 by ⅜-in. steel plates. The bolts are installed on 54-in. centers through pre-drilled holes in the board. Four bolts with two boards in room work, and two bolts and one board for entries are used. The decision to use the boards has proved to be a wise move, for today many of the boards deflect several inches under the load. This indicates that small falls would be numerous without the additional support from the boards. The boards used on main entries or permanent locations are treated with zinc-chloride preservatives.

At the Oriole mine in Kentucky, roof bolting was first attempted at the relatively late date of May 1950, with excellent results. The experience and knowledge of roof bolting gained at the Zeigler No. 3 mine in Illinois was

ROOF SUPPORT COSTS

Method	Mine A Labor	Mine A Supplies	Mine A Total	Mine B Labor	Mine B Supplies	Mine B Total
Conventional Timber*	19.9	8.5	28.4	16.7	10.8	27.5
Roof Bolts**	17.3	8.8	26.1	18.4	20.6	39.0

* First six months, 1950.
** Full year, 1952.

utilized in the proper selection of bolts, shells and plates for the Oriole mine. The roof control problem in the No. 11 coal usually is not primarily the forming of a beam of the roof material, but is a problem of anchoring the 8 to 40 in. of "gob" or shale to the strong Providence Limestone above. This accomplishes the desired effect of storing the shale in the mine, bolted securely and safely to the limestone, instead of falling after the coal is extracted. In non-bolted sections of Oriole we have had several accidents from the falling gob. Should this gob be allowed to fall with the coal and be loaded, the haulage and preparation equipment would not have capacity to move it along with the necessary pay load of coal. We are using ¾ in. diameter bolts with standard expansion shell and 6 by 6 by ¼-in. bearing plate. Under very weak shale, boards are sometimes used between the bolts. Commensurate with the variable thickness of the overlying shale, the length of bolts are 18, 24, 30, 36, 42, or 48 in. The proper length is selected to allow the expansion shell to be anchored at least 8 in. vertically into the limestone.

COAL RECOVERY

Pillar Extraction Under Heavy Cover

By ROBERT F. BOWIE
Planning and Research Engineer
The Union Pacific Coal Co.

CONSERVATION of coal reserves, reduced capital outlay for opening new properties, efficient mining and reduced fire hazard have resulted through the recovery of pillars in Union Pacific Coal Co.'s mines in the Rock Springs field, southwestern Wyoming. Pillars are recovered in all instances unless surface installations, stream beds or rights of way require support.

Minimum depth limit of 30 ft is an arbitrary figure above which the coal is usually stained and unmarketable, while no pillar recovery has been made where the cover is greater than 1800 ft. We are positive that pillars can be mined successfully under as much as 2500 ft of cover with very little alteration of the present mining method.

In developing, slopes are driven to the dip using mobile loaders. Five places are driven, two serving as manways, two as aircourses and the fifth as an unbalanced hoisting slope. These are generally on 75-ft centers. Strike entries are turned off the slope at intervals ranging from 300 to 350 ft. A pair of entries are driven on 60-ft centers to the mine boundaries with either mobile loaders or shaking conveyors. When mine boundaries are reached, shaking conveyors start retreating in rooms and pillars, driving rooms up the pitch to the worked out entry above. The entries are worked out to a barrier room where mining is stopped leaving a substantial barrier of from 150 to 300 ft.

Rooms are driven 24 ft wide on 55-ft centers. When the room reaches the worked out entry above or a barrier pillar, the crew starts mining the room pillar in successive pockets until it is worked out. The first pocket in the pillar is turned approximately 26 ft from the face of the room and driven to the inside cave, holing through to the worked out entry above. When this is mined out the unit is moved into a second pocket approximately 39 ft outbye. The second pocket is turned approximately 75 to 80 degrees to the room line and driven 18 ft wide until the inside cave is encountered. It is then widened until the caved pocket above is encountered. A thin shell is left on the inside while an eight-ft safety stump is left on the outside. This eight-ft safety stump is mined as completely as possible.

In supporting the roof in both rooms and pillars timber is set on a maximum of five ft centers, or closer as roof conditions may require. As the pillar pocket is being mined, a partial breaking row is set even with the low rib of the pillar pocket and perpendicular to the room line. The breaking row consists of three rows of straight timber set on very close centers. Timber is pulled as soon as possible after moving back. Wyoming State Law requires that a mechanical timber puller be used. Posts are pulled one at a time, salvaging cap pieces, wedges and crossbars as they are loosened. Several posts are left in place and weakened by chopping with an axe, to act as a warning or "squealers" in case the roof begins to settle. Caving usually follows the post pull in a few hours and is effectively cut off at the breaking row.

Recovery under this system of mining is relatively high and constant. A recovery of over 80 percent is obtained and maximum extraction must be exercised at all times to prevent ride-over of weight.

Pillar Extraction in Anthracite Coal Mines

By R. M. von STORCH
Superintendent
The Hudson Coal Co.

FOR the first 125 years up to 1900, the room and pillar method of mining was used throughout the Anthracite region. There was very little supervision and miners made connections with adjacent places at their own judgment, sometimes allowing the places to converge until a tap was made which was used as a ventilation connection and the places were turned apart after the connection was made. This resulted in irregular shaped pillars which did not furnish uniform support and eventually caused squeezes which carried over large areas. As the reserves have been depleted, the importance of the coal left in the pillars has increased, until at the present time, production from many collieries is entirely from pillar mining.

Squeezed areas are usually inaccessible for exploration and the best route or road to be reopened is determined from old maps or knowledge gained from mining in the underlying beds. The old airways are generally the best roads to be reopened because of the narrow width and the fact that chamber openings off the gangway are caved to great height. The ideal spacing of reopening development is 300 ft, as this is the general limit for shaker chutes, chain conveyors and scrapers. Single development places are advanced through caved ground, 12 ft wide and 5½ to 6 ft high. Close timbering on 2 to 3-ft centers, using 12-in. or larger diameter timbers, together with forepoling of the sides and top to catch running caves, is common practice. The reopening development is done by machine and by hand.

When the reopening development has reached the property limit, the retreat is started. Shaker chutes and mechanical loaders are used to drive narrow pillar skips, 6

to 8 ft wide, up the outby side of the pillar. The pillar skip is turned left and right to follow the old pillar lines, and the shaker chute is found best suited for this type of work because of its flexibility. Pillars are removed by dropping back 10 ft from the open end, and driving a 10 to 12-ft place through to the cave. A small 10-ft pillar against the cave is then removed on the retreat. No backfilling is done, and when the caving is started, equipment is removed and the new cut through the pillar is started.

Where the roof is very strong, open end pillar mining is sometimes the practice. Low coal pillars, 2½ to 4 ft in height, are recovered by using scraper loaders working across the open end. The scoop, traveling along the robbing face, is sometimes loaded with free coal broken off the pillars by roof pressure, but in most conditions, blasting is necessary.

Greatest depth of cover, where first mining is unsystematic, is usually from 400 to 500 ft. The many troubles due to squeezes and the necessity of extending workings under heavier cover, led to the adoption of systematic mining with the headings and airways driven on line. The minimum centers are 54 ft divided between 24-ft chambers and 30-ft pillars. Larger size pillars are laid out for deeper cover. The greatest depth of cover now being worked in the Anthracite field is approximately 2600 ft. The larger size pillar prevents serious caving. In most locations the reopening development consists of laying track and retimbering weak spots encountered in the roof. The method of removing large pillars where the chambers are open is to reprop the old chamber and extend a shaker chute or a scraper-loader place up to the back of the pillar. The pillar is then removed by driving a 12-ft place through to the inside chamber and recovering the 10-ft stump against the cave on the retreat.

Maximum Extraction In First Mining

By MACK H. SHUMATE
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FULL text of this paper appeared in the March MINING CONGRESS JOURNAL.

Rock Bursts in Coal Mines

By CHARLES T. HOLLAND
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Virginia Polytechnic Institute

A ROCK burst in a coal mine may be defined as the instantaneous failure with varying degrees of violence of part of a pillar, a pillar or several pillars including sometimes strata adjacent thereto, especially the bottom rock. Such occurrences, when extensive, constitute serious catastrophes, and if not controlled, may force abandonment of the mine.

Just what constitutes a strong roof or roof member is open to some question. The strength of a roof member will be determined by its thickness, the distance between bedding planes across which little or no bond exists, the spacing of joints, and the inherent strength of the rock material.

Other factors listed as favorable to rock bursts are: (1) a mountainous surface, (2) steeply dipping beds, (3) proximity of faults. It may be pointed out that many bursts have occurred in mines under mountainous country, but many have occurred in mines under a surface with little relief. It is the thickness of cover and not the relief that is the essential factor. Many bursts occur in mines that are essentially flat and rock bursts have been recorded as occurring in beds dipping as much as 35°. Most rock bursts in the United States occur in beds having a dip of less than 10 percent. But most of our coal is produced from beds that dip less than 10 percent.

Prevention of rock bursts in coal mines is best accomplished if the mine is planned from the beginning to eliminate their occurrence in every way possible. The following points should have particular attention: (1) In complete extraction operations all of the coal should be recovered; (2) Pillar lines should be oriented with the natural fracture system of the roof to promote caving in the goaf and thereby prevent long spans forming over goaf areas; (3) Development in the abutment areas of pillar lines or old goaves should be avoided. This can be done by keeping active development more than 200-300 ft ahead of the pillar line or from the goaf edge; (4) Extraction should be planned to eliminate points formed by converging pillar lines or formed by pillar lines abutting on an old goaf and advancing parallel to the old goaf; (5) Pillars should be recovered by open-end pillaring methods. In such methods the "lift" removed in each cycle should not be more than 12-14 ft wide; (6) Pillars should be as large as practicable in order to provide the strength required to make available the support needed; (7) Pillars should be uniform in size and shape; (8) Pillars should not be split or slabbed except on the goaf side in areas of high stress.

When mining under deep strong cover no absolute preventive of rock bursts in coal mines is known. The measures listed above, should greatly lessen the probability of their occurrence as well as decrease the severity of those that do occur.

Practical Aspects With Bumps in Bituminous Coal Mining

By H. E. MAUCK
General Superintendent
Olga Coal Co.

A COAL mine bump is a sudden, violent release of coal adjacent to the face and side of a pillar. It is believed that bumps occur in two distinct types—"pressure bumps" and "shock bumps." The pressure bump occurs when the loading of a block or pillar becomes greater than the bearing strength of the pillar. The shock bump occurs when a hard rock formation above the coal ruptures and sends severe shock waves through the immediate roof over a pillar, resulting in a hammer-like blow on the pillar. It is further believed that the shock bumps are more common.

There are at least two classes of bumps which occur in Olga Coal Co. mines—"normal" and "violent." The normal bumps occur along all pillar lines. They are assets to mining operations. In normal bumps a sound occurs

similar to the sound from a permissible powder shot in coal. There is very little change in the appearance of the face, but the result makes for ease in mining.

A violent bump is dreaded and destroys men and machines if they happen to be in the path of the flying coal. This type of bump can occur most any place in pillar workings, but there are conditions which seem to promote violent pillar bumping. It is fortunate that many of these bumps happen when men and machines are not exposed.

Experience leads us to the belief that there are several things that can be considered as causes of bumps. They are:

(1) Oversized blocks adjacent to pillar lines.

(2) Pillar work retreating from a barren or "fault" area. As the pillar line moves away from the solid rock, the arch created tends to throw excessive weights on the pillar line.

(3) Misalignment of pillars.

(4) Slow extraction of pillars or the stopping of pillar lines.

(5) Robbing out an area not wide enough to get a major fall of the strata above the seam will tend to throw excessive weight on the pillar line.

(6) Failure to remove coal completely in pillar works will also tend to throw pressures toward a pillar line.

(7) Heaving bottoms that pack against the top will tend to carry considerable weight and retard the fall in pillar workings. This throws additional pressures onto the pillar line.

(8) Excessive timbering and cribs in the mined-out area will have the tendency to retard roof falls and thus throw excessive weight onto the pillar line.

Most persons who study violent bumps in bituminous coal mines of this district believe that they can be stopped by careful engineering and planning and by close observation and forethought.

MECHANICAL MINING

Mechanical Mining in Thin Seams

By WILLIAM J. SHIELDS
Assistant Chief Mining Engineer
Rochester & Pittsburgh Coal Co.

THIS paper describes conventional low coal mechanical loading equipment and some of the methods employed to bring about more economical operations. Seam height varies from 42 to 44 in. Roof conditions are extremely variable; usually the rock immediately above the coal is a black slate. Normally 25 to 35 percent of the working places are in bad roof areas. Quite frequently sandrock rolls are encountered which vary considerably in size. As a result of these conditions, it is often necessary to make changes and adjustments in the projections and operational plans to maintain constant production. A fireclay bottom provides good tramways for shuttle cars except where water is encountered. When the fireclay becomes wet it ruts easily. In such cases a combination of pumping, sump holes, and bridging are employed to provide good travelways.

Within the past several years we have been in the process of opening and developing several smaller belt haulage mines, averaging from 800 to 1500 tpd, from strip highwalls. These are in lieu of the larger underground track haulage operations. Largest area planned to be mined from any of these openings will be 8800 ft deep and 10,600 ft across. This decision was based upon three dominant factors, namely, short travel time for the men, reduction in service labor, and the elimination of rock brushing for haulage equipment. Particular emphasis is placed upon planning and developing toward portal entrances to guarantee a continued short travel time.

General planning and projections for each property are dictated by past operating experiences in this area. All headings and rooms are driven on 50-ft centers. The widths of all places vary according to roof conditions, but in normal, good roof, belt entries are 14 ft wide. All other airways are 18 ft wide and rooms are driven 35 ft wide and 325 ft deep. To provide adequate airways into the body of the mine, main entries are driven in groups of four, which serve as intakes. Four-entry butt headings are developed and rooms on both sides normally worked on full retreat. Cross cuts in butt headings are driven on 50-ft centers to coincide with the rooms. Shuttle car haulage can then proceed directly from the face of each room to the belt.

Two units with conventional type equipment, consisting of Joy loaders and shuttle cars, Goodman cutting machines and Chicago Pneumatic hand held drills, produce an average of 1060 tons raw coal in three shifts. Crews of eight men per shift per unit are employed at the working faces. This number was determined through past experience, the limits of good supervision, and detailed time study analysis of each part of the operating cycle, consisting of timbering, cutting, rock-dusting, hanging canvas, drilling, shooting, and loading. The cycle was built around the loading machine, with particular care exercised to make sure that each part was properly balanced and that each man had definite responsibilities.

Specifications for Efficient Face Preparation

By EMMETT T. LANG
Industrial Engineer
The Powhatan Mining Co.

FACE preparation is the key to high production. A system that leaves a working place properly timbered and the coal shot for easy loadability will allow the loading crew to produce a much higher tonnage. The better and more standardized face preparation, the more consistent is the feed to the cleaning plant. This inevitably results in a better final product.

Face preparation involves ventilation, dust control, roof support, cutting, drilling and blasting. It would be impossible to draw up a set of specifications and expect every mine to follow these. Powhatan operates three mines in the Pittsburgh No. 8 seam in Eastern Ohio within six miles of each other; these show the different ways the basic elements can be combined to meet the natural conditions.

Various methods of roof support are employed. All

entries are held down to 12 ft in width with rooms from 15 to 20 ft. Roof coal of varying thickness is found and the timbering methods vary with this thickness. Where tender roof is encountered, timbers are set on four-ft centers with all cross-cuts and room necks boxed in with four 14-ft timbers. In a section with good roof, only the cross-cuts and room necks would be timbered with all the timbers resting on legs.

Two of the mines are equipped with Sullivan Universal cutting machines and the other with Goodman shortwalls. In one of the mines coal is top cut due to large boulders of iron pyrites in the bottom. In entry work the shear is made on the left rib; rooms are sheared about five ft off the left rib. The other mine with the Universal cuts on the bottom and shears the center of the entry; the same method of off-setting the shear in the rooms is employed. Where the roof is extremely tender, both ribs will be sheared on track entries. The third mine has the Goodman shortwalls equipped with caterpillar trucks.

Two mines use Jeffrey post-mounted drills and the other has the Chicago pneumatic. The different methods of cutting and shearing necessitate the use of different drill patterns. Where top cutting is done, entry cuts are drilled with two stone holes and two coal holes drilled close to the bottom. In room work three stone holes and three coal holes are used; the number may vary depending upon the width of the room and the placement of the shear. Bottom cutting and center shearing necessitates an altogether different drill pattern. In entry work, two stone holes and two coal holes are used for a 17-ft room.

Where airdox is used the coal is shot first and loaded out before the stone. This is necessary due to lack of cleaning facilities. With permissible explosives, the shots are fired singly. Previously, we practiced multiple shooting, but our loading crews were finding unfired shots so we returned to single shooting. Since then we have lessened our powder consumption considerably and have our working places shot for easier loadability with more of the larger coal sizes. In a recent study, an average of 6.80 tons of raw material was blasted for each pound of explosive used.

Face Preparation Problems in Two Seams in Western Kentucky

By W. L. HUSK
Chief Engineer
West Kentucky Coal Co.

THERE are four producing seams in Western Kentucky, two of these, Nos. 9 and 11, are very regular throughout the field. No. 9 averages 4½ to 5 ft in thickness and is 75 to 100 ft below No. 11. It usually rests upon a hard fireclay bottom from 4 to 6 ft thick. The immediate roof is of slate, under a kidney bed, and the main roof is 20 to 30 ft of sandy shale under a sandstone. The seam generally dips on an average grade of about ¾ of one percent; grades of over three percent are few.

The coal has a rather high inherent ash and in most instances is hand picked. There are extraneous impurities in the coal which consist of lenses of high sulfur bearing sandstone. These are interspersed through the seam to form ill-defined bands rather than actual partings.

There is considerable draw slate in some areas. When thick this must be held, if possible, but when it is thin it may be loaded and picked out on the tipple. The standard method of timbering has been to set posts along the ribs on four-ft centers leaving 12 ft unsupported in the middle for travel and haulage. In some sections the slate is shaly and will slough off between posts and bars so that lagging must be restored. It is customary to cut entirely in the coal so as not to contaminate the slack.

Roof control problems have been partially met by roof bolting. The rotary drill, using ¾ in. by 36 in. or 48 in. bolts in the entries, and wooden pins in the rooms has been very helpful. This is not a substitute for simple posting as done in our own mines, except at turns and around loading points.

The problem of excessive fines has been partially overcome by the use of Cardox and then Airdox; although powder still remains the favorite explosive. It all depends upon the product desired. With adequate supervision, Airdox will give as good loadability as powder, but it does require more supervision than the use of powder.

The No. 11 seam averages 5½ to 6½ ft thick with a fireclay bottom from 4 to 20 ft thick. The immediate roof is gob 6 to 24 in. thick, under 24 to 72 in. of limestone.

The seam generally follows the same grade and modifications in bedding as the No. 9. The standard method of mining is by the room and pillar system, using 24-ft rooms with 16-ft pillars and 14-ft entries with 20 to 30 ft pillars. Recovery is about 60 percent. The tipple reject amounts to 25 percent of the mined material.

The No. 1 problem of difficult roof conditions has been largely met by roof bolting. Bottom is soft so that squeezes are frequent, especially where the bottom is thick or wet. It is customary to drive as few entries and rooms as possible, namely, three entries and six rooms; but present plans call for six mains on 60-ft centers, four panel entries on 40-ft centers, and six rooms. Due to the danger of squeezing, most panel work is on the retreat. The seam is gassy and places are frequently wing curtained.

CONTINUOUS MINING

A Review and Forecast of Continuous Mining

By M. H. FORESTER
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Pittsburgh Consolidation Coal Co.

FULL text of this paper appeared in the April MINING CONGRESS JOURNAL.

A Review and Forecast of Continuous Mining

By HAROLD B. WICKEY
Vice-President
Pennsylvania Coal & Coke Corp.

FACED with the absolute necessity of cost reduction if the coal industry is to survive, there has been made available a new type of mining machine that potentially has the capacity to make the necessary cost reduction. However, mere introduction of the machine is not the answer to the problem. To obtain the greatest benefit from the

potential of the machine it is necessary that our thinking be changed to permit new methods of mining to be introduced, new methods of transportation of coal to be tried, and every phase of the mining cycle geared to the ultimate goal of a continuous flow of coal from the face to the railroad car.

For those who have not as yet decided to alter their present type of equipment or methods, attention could be given to the possibilities of Modified Longwall. There have been several successful installations of longwall equipment in recent years, and when comparing the results obtained with these units with the continuous mining machine we find that there is a high degree of similarity in cost reduction at the face. True it will be necessary to solve the roof control problem but it is believed that solution will be forthcoming.

We have not solved the problem of transportation of coal from the continuous machine to the mine car or belt. Although the industry is providing make-shift methods, still it is a long way from the true solution to this particular problem. A method of transportation must be provided that will permit the transportation system to be extended through its own power, and retracted through its own power, with the minimum expenditure of labor and time.

Proper ventilation of the working place or places of a continuous mining machine has not proved to be the serious problem that we once thought it would be.

Maintenance costs have been extremely high. This is one factor that must be worked out with the manufacturer. When continuous machines were first introduced it was found that the machine should be taken from service for a general overhaul after 40,000 to 60,000 tons of coal. With the improved machine design coupled with the increased experience of mine maintenance organizations, the general overhaul period has increased to approximately 125,000 tons.

The flexibility or the ability of the continuous machine to maneuver from place to place is directly related to the method of mining employed. Where the conventional room and pillar system is used, with no modification, it is necessary that the machine be as flexible as possible. Unfortunately, the more flexible the machine, the lower its productive capacity, therefore to obtain the greatest degree of efficiency we must strive toward full face extraction of coal and devise mining systems which will permit the greatest efficiency from the full face machine.

Continuous Haulage For Continuous Mining

By W. B. JAMISON
Vice-President
Jamison Coal & Coke Co.

and

The Mobile Continuous Conveyor

By JAMES D. SUTTON
Electrical Engineer
Clearfield Bituminous Coal Corp.

FULL texts of these interesting papers will appear in the August MINING CONGRESS JOURNAL.

Remotely Controlled Bore Mining

By P. L. ALSPAUGH
Manager, Coal Utilization Projects
Carbide and Carbon Chemicals Co.

MR. ALSPAUGH'S paper was received too late for an extract to be included in this issue. His full paper will appear in the 1953 edition of *Coal Mine Modernization.*

UNDERGROUND HAULAGE

High Capacity Track Haulage at Mathies Mine

By D. H. DAVIS
Vice-President
Mathies Coal Co.

FULL text of this paper will appear in the July MINING CONGRESS JOURNAL.

Main and Secondary Track Haulage

By FRANK LA ROCHE
Superintendent
Snow Hill Coal Corp.

LIMITING factors such as a shaft and hoist of certain capacity and inside face workings of certain characteristics have combined to persuade many operators to go to belt conveyors rather than wage an uphill battle to make rail haulage more efficient. However, it may be that belt haulage is not the over-all answer, since some companies after using conveyors have returned to track and mine cars, and a survey may show that your haulage problems can be solved with an efficient track haulage.

A careful inspection of the present haulage system from an engineering standpoint may show that the remaining coal could well be taken by another route to save many useless miles of haulage. There will probably be grades which could be leveled out, with much saving of power and time. It may be advantageous to mechanize major labor operation by using air impact wrenches for tightening track bolts, air tampers for proper ballast packing, and special trucks for handling supplies.

After such an inspection the operator will have the material to work with in deciding whether to repair, rebuild, or replace existing track and roadbed. When considering haulage improvements, it might be well to remember that dependable haulage and efficient haulage are probably every bit as important as high-speed haulage.

There is no advantage in hauling coal trips at breakneck speed to a sidetrack just to sit and wait.

Proper planning at the point where the main line trips are made up will mean that the motors can pull into the sidetrack controlled with automatic switches and clear themselves without any help from the brakeman or another motor. In many cases the use of brakemen or tripriders can be eliminated. Sufficient sidetrack with proper entrances and exits should be planned so that minimum interference results when the main and secondary haulage motors arrive at the same place at identical times. It would also be good to supplement any other type of communication with some simple two-way signal to eliminate confusion as to location of loads and empties as well as trip travel.

Haulage equipment needs a close inspection also. Certainly in some cases cars are just naturally worn out and need replacement, or maintenance expenses grow too high. One thing is certain, you do need enough (and not any more) mine cars in good condition. Pairing up old locomotives and running them in tandem is often the answer to the need for larger capacity locomotives. Controls for such units have proved successful and, with a little planning, it is possible to use them in tandem or separately with very few changes. The possibility of achieving added dependability and efficiency with such additions as hydraulic brakes, air brakes, air sanders, air controller, larger wheels, and automatic lubrication should not be overlooked.

Any good haulage system needs a good communication system. This can be achieved with well-located mine telephones or radio telephones on the locomotives. In most cases, it should be possible through radio telephones on the locomotives to eliminate dispatchers, trippers and switch throwers, so common to many of our coal mines today.

A Complete Belt Mine

By JOE CRAGGS
Assistant Division Superintendent
Peabody Coal Co.

FULL text of this paper appeared in the May MINING CONGRESS JOURNAL.

Transporting Men and Supplies in Belt Conveyor Mines of The Carbon Fuel Co.

By H. A. JONES
General Superintendent
Carbon Fuel Co.

THE Carbon Fuel Co. has two belt haulage mines. One is in low coal which averages 36 in. The top requires close timbering and the bottom is very soft. Coal at the face is loaded by machine on chain conveyors that discharge at room necks onto the belt conveyor system which extends to the surface cleaning plant. The average production is 1300 tpd.

Twelve years ago when a belt operation was started at this property reversible belts were considered. By this method the mine could be supplied on the third shift. At the beginning of the first and second shifts the men could be transported to the room necks; at the end of each shift the men could ride out on the belts. This part of the planning was reasonable, but other factors had to be considered. Belt haulage is a one-way system which presents some problems.

After considering the difficulties, it was decided to install two distinct transportation systems; a belt for transporting coal and an auxiliary haulage for handling men, supplies and equipment. This auxiliary system is track and mine cars. The track is laid with 30-lb rail on steel ties at 44-in. gage in the supply entry which is next to the main belt conveyor. In room panels it is in the same entry as the belt.

About five years ago it was decided to use belt transportation in a seam which has a height of five ft. This mine has an average production of 1200 tpd with a maximum haul of 6000 ft. Underground equipment consists of rubber-tired, self-propelling cutting machines, loading machines and shuttle cars. The haulage system from the room neck to the cleaning plant is all-belt. By means of a stationary tripper and chutes on the main haulage belt, slate and other impurities are removed by auxiliary belts to slate disposal.

Due to the five-ft seam height, which permits easy travel for men and supervisors, and again, due to the comparatively short haul and small quantities of material necessary for roof support, it was decided to use battery-powered rubber-tired tractors with trailer car for handling supplies. Timber ramps are built over the belt lines where desired and boom holes are not necessary. In case of an accident, the man is brought to the surface by stretcher bearers or on the tractor, depending on the seriousness of the accident. Men walk to their working places and ride out on the belts.

The mine has now reached its maximum haul of 6000 ft. The battery-powered rubber-tired tractors with trailer car attachments have withstood severe service. Maintenance cost has not been prohibitive and results are considered satisfactory.

POWER

Reversed Polarity For Mine Circuits

By E. L. PARKER
Mining Section
Westinghouse Electric Corp.

YEARS ago conversion equipment supplying mine dc electrical circuits from ac incoming supply was either the rotary converter or motor-generator set or both.

The ignitron mercury arc rectifier was developed for mining service in 1937 and has grown in favor due to certain operating advantages. The first units were more suitable for positive grounded operation due to electrolysis of the water system and to safety precautions, since these units were entirely open and some apparently grounded parts of the units were energized at positive potential. It was recommended the rectifier be installed with positive terminal grounded to rail and many of the earlier units were so designed and installed.

A few years later several reported and a few substantiated cases of trolley hanger and cable insulation failure on negative trolley systems led to change in the recommended connection of the rectifier. Units were then designed for either trolley polarity operation as specified by the mine operator. On positive trolley systems the heat exchanger was insulated from the rectifier tube tanks, or from frame and ground, to minimize or eliminate the electrolysis problem in the cooling system.

Electrolysis of buried or grounded metallic bodies acting as stray current conductors parallel to the rail in general occurs regardless of the polarity of the system, due to undesirable and non-uniform mine conditions. Measures to remedy electrolysis near the substation are less complex, more economical and more easily installed on a positive trolley system.

The electro-dynamic performance of dc electrical apparatus in the mine is the same for either polarity system provided the proper terminal connections are made corresponding to electrical or "positive" and "negative" polarity rather than to physical or "trolley" and "rail" polarity.

Certain instruments, meters, and special control devices may depend upon the direction of current flow or upon specifically connecting terminals to trolley and rail irrespective of electrical polarity. Changes in these connections must be made when changing the polarity of the system.

Although there are many negative trolley systems in operation without significant problems of electrolysis or safety at the conversion equipment, on the insulated trolley system or on the grounded system, consideration of the above factors and experience in specific cases led to conclusions in agreement with the following recommendations of the National Association of Corrosion Engineers, endorsed and amended by the Committee on Underground Power of the American Mining Congress:

NACE: (1) Negative grounding of dc traction power supply equipment, including rectifiers, is preferable from the standpoint of the stray current electrolysis problem on underground structures in the mine and on other structures in the vicinity, such as pipelines, cables and the like.

(2) New installations of dc power supply equipment should be grounded on the negative side.

(3) Every consideration should be given to converting existing positive grounded systems to the negative grounded arrangement.

AMC: (4) In converting existing electrical equipment, particularly old style rectifiers, from grounded positive to grounded negative operation, the electrical manufacturers should be consulted for their comments and recommendations of the best procedure to be followed.

Special conditions may dictate the preference of one system over the other, but it appears the "standard polarity" system is now generally agreed to be equal to or better than the "reversed polarity" system in all areas of influence of polarity on the operation of mine dc electrical circuits.

Reversed Polarity For Mine Circuits

By H. B. BUCKINGHAM

Electrical Engineer

Engineering Dept., Raw Materials Div., Tennessee Coal & Iron Division

U. S. Steel Corp.

REVERSED polarity for mine circuits is a matter of concern, partly because metallic sodium or potassium has been found in underground trolley hangers. These elements in the metallic state are highly reactive or explosive. It is believed that the possibility of the hazard they present has heretofore passed unrecognized or has been dismissed as incredible, if suspected.

Short Creek and Concord Mines are powered by 300 kw mercury arc rectifiers. At both of these mines, the trolley is negative and the positive is at ground potential.

During the second year of negative trolley installation at Short Creek, it was apparent that the insulator and insulation failures were excessive. Investigation and study of this problem revealed that most of the troubles were a result of "electrical endosmosis." This means that the negative potential tends to attract ions and moisture to the negative circuit. Under this condition, insulation can deteriorate rapidly.

As insulator failures increased, the electrical laboratory was requested to make corrosion tests. A failed insulator assembly was obtained from Short Creek mine. This assembly included a 14-in. length of hanger pipe. The pipe was being washed out when there was an explosion inside it. From chemical analysis, the pipe was found to contain metallic sodium.

This discovery of metallic sodium presented a grave situation and an immediate study was begun. Physical conditions at the spot were studied. Numerous samples were taken for chemical analysis. Shortly thereafter, similar inspections were made at Concord Mine where the trolley wire is negative and at Edgewater mine where the trolley is positive.

No metallic sodium was found in any of the other samples; however, high percentages of caustic soda and sodium carbonate were found in all Concord and Short Creek deposits. Neither was found associated with the positive Edgewater hangers.

After conferring with the rectifier manufacturer's representatives, a joint inspection was made of the old and new type rectifiers to determine exactly what changes would be involved in rectifiers and other electrical equipment if the rectifier polarity were changed.

After studying all the facts and circumstances concerning negative trolley installation, it was clearly indicated that the negative trolley should be changed to a positive trolley. Accordingly, all necessary insulating and screening changes at Short Creek and at Concord will be made.

Reversed polarity and the accompanying electrolysis caused this situation

SAFETY

Degasification of Coal Seams

By G. R. SPINDLER
Director, School of Mines
West Virginia University

MR. SPINDLER'S paper was received too late for an extract to be included in this issue. His full paper will appear in the 1953 edition of *Coal Mine Modernization.*

Coal-Dust Sources And Control Underground

By JAMES WESTFIELD
Chief, Health and Safety Division
LESLIE JOHNSON and
FLOYD G. ANDERSON
Mining Engineers, Health Branch
U. S. Bureau of Mines

THE United States Bureau of Mines, in recommending dust control in coal mines, has two distinct objectives in view, first, to prevent coal-dust explosions, and second, to eliminate health hazards.

Sources of coal dust may be divided into two groups. Among the primary sources may be included the grinding action in coal beds with heavy overburden, particularly in pillar sections. This grinding action creates quantities of dust, which is released to the mine atmosphere as the coal is mined out. All face operations, such as cutting, drilling, blasting, loading, and continuous mining, may be considered primary sources of coal dust. Secondary sources include such operations as haulage, movement of equipment, and operations in the tipple.

Certain basic facts generally are agreed upon by those concerned with suppressing dust in underground operations.

(1) Suppressing or collecting dust at the source of generation is best in obtaining effective control.

(2) Dust that has escaped suppression at the source and becomes airborne is difficult to remove from suspension.

(3) Application of water in many operations is the most practical means of control.

(4) Any direct control method must be supplemented by ventilation.

Other general considerations are:

(1) With the increasing attention being given to the possible physiological effects of very fine particles, control methods, even though apparently effective as evaluated by ordinary sampling techniques, should be studied critically to ascertain whether control of these very fine particles is being accomplished.

(2) Conditions vary, as regards coal beds and methods of mining. Control methods are not uniformly applicable but may require modification to meet conditions.

(3) Best results are obtained when surveys of dust concentrations are made frequently to evaluate the performance of control measures.

(4) With increasing mechanization and more rapid methods of mining, the designers of equipment should give increased attention to provision of effective means for controlling dust produced by the machines.

(5) Research on fundamental factors relating to the control of dust should be promoted, as well as practical experiments conducted under actual operating conditions.

(6) Effective control of dust is best obtained if a spirit of "dust consciousness" is present in the minds of workers and management, so that efforts are coordinated to achieve the necessary results.

At least one manufacturer of continuous mining equipment is considering installation of an auxiliary ventilating system to assist in dust control. This would consist of an exhaust fan installed in an air course adjoining the entry in which the continuous miner is operating. A duct from the fan would lead to a cyclone-type dust collector installed in the last crosscut. Another duct leading from the collector to a point near the head of the continuous miner would draw dusty air from the face through the collector, and clean air would be returned to the air course. Still another arrangement being considered is a fan and filtering unit installed on the machine.

COAL PREPARATION

Mine Operating Factors That Affect Coal Preparation

By R. L. LLEWELLYN
Preparation Engineer
Eastern Gas & Fuel Associates

FULL text of this paper is presented on page 41 of this issue.

Mine Operating Factors That Affect Coal Preparation

By CLAYTON F. SLACK
Preparation Engineer
Sahara Coal Co., Inc.

THE purpose of this paper is to discuss in a general way the following operating factors and their influence on the plans for building or rebuilding a coal preparation plant: (1) Continuous mining; (2) raw coal crushing; (3) raw coal storage; (4) three shift operation.

If a company is planning a change-over to continuous mining, consideration should be given to the enlargement of fine coal preparation equipment, or reduced plant capacity may result. Some companies obtain better mining results by employing two different makes of mining machines or a combination of conventional methods and continuous mining. In either case, a wide variation in plant feed results and blending bins may be a necessity if ample plant facilities are not provided.

Crushing of run-of-mine coal prior to feeding a plant is desirable. Some companies still market a lump product, and this necessitates a picking table and a crusher by-pass to be used at those times when this product is being produced.

Raw coal storage is necessary when a central preparation plant serves more than one mine. Storage is attractive from the mine operator's viewpoint as mine production is not hampered by minor plant breakdowns and conversely the plant feed is not influenced by surges in the mine output.

The operation of surface stockpiles or large underground hoppers often becomes a problem due to the segregation that takes place when the coarser pieces roll to the outside while falling. In the case of silos, due to their relatively small diameter with respect to their height, this type of segregation is of less consequence. Then, too, if multiple silos are employed, feeding from all simultaneously helps to overcome any difference in size consist. Crushing the run-of-mine prior to storing, and thereby narrowing the size range, will also decrease segregation.

Preparing coal in a plant three shifts a day has the advantage over single shift or double shift production because of the lower capital expenditure involved in building the plant.

However, before definitely deciding on a three-shift operation, a company should give just consideration to proper maintenance. If standby equipment is installed, the total initial cost rises toward a plant of greater capacity and partially defeats the original purpose of trishift production. Without standby equipment more "down" time on producing shifts results.

Surface moisture is an important factor to the man who is attempting efficient raw coal screening and raw dedusting. Many of the new air cleaning plants are provided with raw coal dryers to cope with the increased surface moisture condition. The use of water sprays on mining machines to allay dust increases the moisture figure to some extent. Any type of a surface storage without housing is subject to precipitation and ROM crushing, prior to storage, simply adds more surface area for water adherence.

Fine Coal Cleaning at Island Creek Coal Co.

By MATHEW TURKOVICH
Director of Preparation
Island Creek Coal Co.

NO. 27 PLANT is of steel and concrete construction throughout. It was designed and erected by Roberts & Schaefer Co., and placed in operation January, 1950. It has six loading tracks and was designed to process 400 tph of raw material. At present it is operating two 7¼-hr shifts daily with a feed of 435 tph and producing 4200 tons of clean coal daily. The raw material contains about 18 percent rejects and separation is made at 1.50 specific gravity.

The processed coal is from the Lower Cedar Grove Seam. The coals above ¼ in. are processed by hand picking the plus five-in. lump and washing the five by ¼ in. by a combination Trough Separator and Link-Belt, two-compartment, five-cell Baum Jig. Since about one-fifth of the total clean coal is ¼ in. by 0, management was faced with the problem of providing a cleaning system that would produce a fine coal product comparable in quality to the other processed coals and finally reached the conclusion that the wet system would provide the following: (1) a uniformly low ash coal; (2) a low moisture coal; (3) a means of salvaging the slurry developed in cleaning the coarse coals; (4) a possible means of eliminating stream pollution and (5) the maximum coal recovery.

A wet system was installed and is now operating efficiently with a total raw coal feed of 63 tph of mine run slack and three to five tph of slurry. A hydrotator and classifier, manufactured by the Wilmot Engineering Co., process the ¼ in. by 0 coal. A portion of the minus 28-mesh overflow product from the classifier is processed by froth flotation through a six-cell Denver Unit. The plus 28-mesh product from the hydrotator and classifier is mechanically filtered through two C.M.I. Units of 45-tph capacity. The minus 28-mesh is filtered in two Denver vacuum filters. The combined filtered products are then thermally dried by a Raymond Flash Dryer.

The wet system of fine coal cleaning has produced the following results: (1) the average ash in the clean ¼ in. by 0 slack for the past several months has been 4.75 percent. This compares favorably with the ash content in the other five grades. (2) The average surface moisture has been 2.85 percent. (3) It has provided a means for salvaging about 50 tons of slurry per day that otherwise would have been thrown into the refuse because of its high ash and moisture content. (4) The stream pollution problem has not been completely solved but under normal running conditions about 85 gpm of brownish-gray waste water with 2.64 percent solids are discharged into the nearby stream. The solids have an ash content of about 80 percent and the water is neutral with a pH of 7.8. The waste water does not have the characteristic black appearance that is common to waste from coal preparation plants. (5) Coal recovery from the fine coal system is about 90 percent of the raw material processed.

No. 27 preparation plant of Island Creek Coal Co.

Anthracite Fine Coal Cleaning at Coaldale Plant

By WM. T. TURRALL
Supervisor of Preparation
Lehigh Navigation Coal Co.

PLANNING for the modern fine coal plant at Coaldale began in the fall of 1949. The first coal was produced in December, 1951. The equipment incorporated in the plant design was selected in the belief that it was essentially correct for conditions at Coaldale. An important detail in the design of the plant was determination of the maximum peak load which would occur at brief intervals. Any of these could cause a serious change in the quality of the coal product, or actually result in an overload, effecting a blockage of a machine and necessitating a shutdown of the main plant.

This slurry or pulp is pre-classified in a 24-ft diameter hydro-separator to remove about two-thirds the volume of water and one-third the weight of the solids all of which is flotation size or smaller. The underflow of this hydro-separator containing the No. 4 and No. 5 Buckwheat is pumped at the rate of 3500 gpm to a height of 50 ft to obtain gravity flow for practically all other phases of the operation. The pulp contains two other sizes which must be removed by screening if efficient cleaning is to be accomplished by machines employing hydraulic classification methods. They are, first, the coarse oversize that inevitably becomes associated with the main breaker effluent either by spills or broken jackets, and, second, the fines normally expected in any pumping system from a tank.

The launder screen is rapidly becoming the universal screen for use in sizing large tonnages of fine anthracite. There is practically no maintenance cost other than the replacement of screen cloth, and this is comparatively low. It is more than possible that its application can be extended to coarser sizes providing the essential factors of slope, percent solids in the feed, and orifice design are studied for each problem in use.

The flotation section treats the overflow from the 24-ft hydro-separator together with the fines from the No. 4 and No. 5 cleaning equipment. A 45-ft diam Dorrco hydro-separator with hydraulic lift is used to thicken the flotation feed and remove the majority of the minus 200 mesh in the 7700 gpm containing roughly 145 tph; 46 percent of which is minus 200 mesh. The underflow of the hydro-separator is pumped at 35 percent solids by two eight-in. Dorrco Duplex Diaphragm pumps at the rate of 600 gpm. Each pump discharges into an eight-ft classifying conditioner designed by the writer; it incorporates the essential features of the Wallace Type Super Agitator Conditioner but employs a simple classifying zone on the bottom.

The flotation froth is dewatered by the use of cyclones and Robins four by 16-ft dewaterizer screens dressed with ¼ mm. The froth at 36 percent solids is pumped at low pressure through a 24-in. cyclone. The thickened product discharges onto the screen and forms a bed. The effluent from the cyclone, together with the underflow of the screen, amounting to 25 percent of the original flotation froth is pumped at 30 psi through a 12-in. Dorrclone. This cyclone removes the greater percentage of the high ash —200 mesh mechanically entrapped in the flotation froth, resulting in lowering the ash of the flotation coal 1 or 2 percent.

The final phase of the operation is the treatment of the 45-ft hydro-separator overflow in a 180-ft diam Dorr thickener. The settled solids are pumped to an impounding basin. Settling of the fines does not require the use of lime. Five thousand gpm of the thickener overflow containing 400 ppm are recirculated to the breaker. The excess is allowed to flow into Panther Creek since it is within the allowable limits of the Pennsylvania Anti-Stream Pollution Laws.

Fine Coal Handling At Georgetown Preparation Plant

By WENDELL E. BEARCE
Preparation Engineer
Hanna Coal Co.

BETWEEN 250 and 300 tph of raw, minus ¼ in. coal are handled at the Georgetown Plant. This represents some 18 to 20 percent of the plant feed and is separated from it on a pair of double deck screens. Each of these has an 8 by 40-ft lower deck covered with 12 gauge stainless steel, perforated with 5/16-in. round holes.

The ensuing circuit is as follows: (1) The product goes by gravity, through a splitter to the six drag conveyors in the Raw Coal Tank. (2) The minus 100 mesh overflows with the water. (3) The settled material is sluiced from the discharge of the conveyors to distributors which apportion it to 31 Super Duty, Diagonal Deck Deister Tables. (4) Table refuse is collected on belt conveyors which dewater it and deliver it to the main refuse belt. (5) The table product is sluiced to the clean coal tank directly below the table floor. (6) Six drag conveyors dewater the clean coal to about 25 percent moisture and deliver it to six Reineveld Centrifugal Dryers. These reduce the moisture to 8 or 9 percent. (7) This product is further dried to 4½ to 5 percent total moisture in Raymond Flash Dryers before shipment.

Baffles have been installed in both settling tanks to study their performance. Three sets made of cypress plank running the full width of the tanks were put in on two-ft centers about 24 ft from the water discharge end of the tanks. These were placed with their tops eight in. below the water surface. They are 3½ ft high in the raw coal tank and 2½ ft high in the clean coal tank. They are inclined 70° from the horizontal and slope down toward the coal discharge end of the tank. Their effect can be seen from the following before and after figures taken from the raw coal tank. With baffles the percent solids in the overflow increased from 4.6 to 5.0 percent, the +100 mesh material decreased from 16.5 percent to 2.7 percent while the minus 200 mesh increased from 53 percent to 82 percent.

A study has also been made of the effect of tank depth. The water level in one half of the raw coal tank was reduced from 71½ to 39 in. Because of the curved bottom at one end of the tank this reduced the length at the water surface by 12 percent, cutting it down to 57 ft. To compensate for this disadvantage, the baffling was increased in the shallow half. Samples were then taken of the overflow of each half and their averages compare as follows:

	Deep Tank	Shallow Tank
Solids	6.85 percent	7.07 percent
—100 mesh	98.3 percent	94.7 percent
—200 mesh	88.5 percent	83.7 percent
—300 mesh	78.1 percent	71.4 percent

Coal Preparation With New Type Heavy-Media Operation

By J. B. TAGGART
Vice-President
Wise Coal & Coke Co.

THE Wise Coal and Coke Co. has been operating mines and beehive coke ovens in Wise County, Va., for nearly half a century. Since 1938 the main production has been from the Norton seam which will generally average from 38 to 40 in. thick, with a hard slate band of from three to six in. near the middle of the seam. In 1949 advancing entries began to encounter changing seam conditions. By early 1951 it had become apparent that some type of cleaning plant was needed and studies were made to decide which of the various types available would best fit.

Washability tests had proven conclusively that the cleaning plant would have to be highly flexible, because future seam conditions were going to vary tremendously. It seemed that a heavy media plant with a table section was probably the best solution. The contract was awarded to the Western Knapp Engineering Co., subsidiary of the Western Machinery Co., and construction was begun in July, 1951; it was completed in February, 1952, and has been operating since with only a few modifications and changes.

One of the interesting deviations in flowsheet practice involves the operation of an eight-ft diam by 12-ft long two-compartment drum separator—the first of its type to be placed in operation. The unit is designed to produce three products in one pass. Both compartments of this separator use finely ground magnetite suspended in water. In the operation of the drum, pre-sized and prewetted run-of-mine coal is launder-fed into the first or low gravity compartment. A coal float product is continuously removed from the first compartment by overflowing a circular weir located in the feed end of the drum. The sink product from the first compartment, containing both middling coal and refuse, is discharged into a sink chute passing through a partition between compartments into the second or high gravity compartment of the drum.

Separation takes place at a somewhat higher gravity in the second compartment, with middling coal being produced as a float product and refuse as a sink product.

The ¼-in. by 0 fine coal, collected from the preparation screen undersize, passes through a rotating distributor feeding to five Deister tables making up the fines treatment plant. Clean coal from the tables is pumped to a dewatering screen which discharges to a belt conveyor passing to a fine coal storage bin. Table refuse is dewatered in a No. 24 Wemco coal spiral and passed to the refuse bin.

The five tables are arranged to receive, when desired, the middling coal from the HMS plant, which first passes through a ring crusher and is reduced to ¼ in. in size. Middlings may be treated separately from other ¼ in. minus material if desired.

STRIP MINING

Overburden and Coal Haulage in Deep Strippings

By F. W. CHESNEY
President
Shen-Penn Production Co.

THE past fifteen years have probably seen greater advancement in the stripping industry than ever before. In the successful development of deep pit anthracite strippings particularly, it can be said that improved haulage equipment has been a major factor. Where the overburden must be transported, often well over a mile on comparatively steep grades, it is evident that haulage represents the greatest single element in over-all cost. Therefore in this phase of the work lies the greatest opportunity to lower that over-all cost.

Modern haulage units are designed and equipped to carry as much as 50 to 60 tons of rock, loaded by shovels having dipper capacities up to eight cu yd. Their powerful engines can haul these loads on adverse grades often exceeding eight percent. They have rated speeds up to 35 mph on a level haul. Some are equipped with torque converters and automatic transmissions that eliminate conventional clutch troubles and make for smoother operation. Spring mounting and power steering are important factors in reducing wear on men and machines. Less apparent to the eye, but no less important, are improved parts resulting from advancements in metallurgy.

With this modern equipment the ratio of one or two cu yd of overburden removed to one ton of coal recovered in the early days of stripping has increased to more than seven cu yd of overburden to one ton of coal recovered. Stripping pits have been excavated in benches to well over 400 ft and are planned to go considerably deeper. In these operations coal is recovered from as many as eight different beds, on pitches from flat to vertical, and ranging in thickness from one ft to 100 ft or more.

Indications are that the trend in strip mining is toward bigger and better haulage units. Perhaps capacity as such should not be over-emphasized. The trend in size will no doubt be controlled by the physical limitation of haulage roads, pit space and flexibility. There is also the fact that increasing the size of the haulage unit does not necessarily lower the unit haulage cost. Increased capacity, accompanied by more than a proportionate increase in the cost of operation, will have the opposite effect. It may well be there is a limit to economical body size beyond which any improvement ought to be in the way of lighter gross loads and higher speeds on the long steep grades out of the pits.

There is no doubt that further improvements will be forthcoming in:

(1) Increased pay load in relation to gross weight.
(2) Greater flexibility in necessarily tight quarters.
(3) Further improvement in quality of parts.
(4) Better service in having parts available when needed.

Stripping operators might give consideration to these:

(1) Pit layouts with haulage roads as short, straight, and uniformly graded as physical conditions will allow.
(2) Roads constructed of the best materials available and well drained.
(3) Additional areas to strip at increasingly higher ratios.

Overburden Haulage Trends

By R. C. GESSEL
Field Engineer
Le Tourneau-Westinghouse Co.

COAL and overburden haulage equipment in open pit mining is following a definite trend, rather than drastic changes and will probably follow the pattern of development of other open pit mining equipment. By looking a bit into the past and examining the trend of the shovel and dragline development, which is most closely allied with haulage units, it should be possible to make some general predictions as to what is in line for development of hauling equipment.

Initial cost and cost of operation of a large hauling unit demands that loading units be properly sized to accomplish the loading cycle quickly. Reducing loading time to a minimum, requires that high capacity shovels be used. Mine operators are already using four to five cu yd shovels to load large haulers. It can be expected that units of over 50 tons, or 40-cu yd capacity, will be loaded with shovels and draglines of 10 to 15 cu yd capacity.

During the winter and throughout rainy periods an up hill haul with slippery winding roads and grades of over eight percent present a very real traction problem. As pits go deeper, the grades will increase. Increasing the size of hauling units beyond the maximum sizes of today will probably necessitate going to all-wheel drive. All-wheel drive has been successful on medium sized trucks for intermittent use but in mechanical driven vehicles of large size, front wheel drive means the solution of a multitude of mechanical problems such as maintenance and repair of steering knuckles, universal joints, drive shafts and suspension systems.

Capacities hauled require increased horsepower as size of units grow larger. To get this horsepower, the trend has been toward twin engine power rather than single. Twin engines have their disadvantages in as much as they require much dual auxiliary equipment in the way of drive shafts, universals, torque converters, etc. Coupled with this is the problem of synchronization of engines, methods of installation, operation and increased fuel consumption. Large single engines can be expected to bring corresponding increases in size and capacity of auxiliary equipment such as batteries, starters, and other accessories.

Just how large haulage equipment will become for open pit mining will depend on the number of applications large enough to support it. It would appear currently however that the future will show a decided shift to 35- and 50-ton units. At the present, 50 tons seems to be the practical limit.

Equipment Application in Strip Mining

By E. E. HOWARD
Special Representative
Sales Development Div.
Caterpillar Tractor Co.

EQUIPMENT selection and application practice found on all earth-moving jobs are generally usable in strip mining of either anthracite or bituminous coal. Track and wheel-type tractors with scrapers and wagons and track-type tractors with bulldozers have been proved to be particularly versatile in coal stripping applications. In some stripping operations, these tools are used exclusively for overburden removal and they are being accepted more and more as auxiliary equipment in operations where large shovels and draglines are used for the removal of overburden and loading coal.

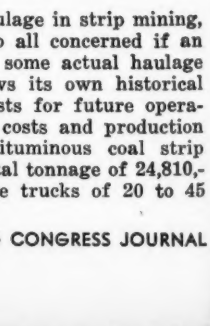
The tractor bulldozer performs a wide variety of jobs from clearing, pioneering and cleaning up around the stripping shovel to push-loading scraper units. The bulldozer is used as a production tool for the small and medium sized operators. In fact it may be the only machine utilized on stripping. In these cases, generally the bulldozer will be stripping out-crop or the edge of the coal where the overburden is not too deep.

Tractor-drawn scrapers are used when the hauls become somewhat longer than is economical for the bulldozer with a maximum hauling distance up to 1500 ft. The towed-type scraper operation may be designated as the second zone of work where maximum power is combined with the largest scrapers and run at slower speeds than the wheel-type units. The scrapers utilized in this medium haul zone are generally 15-20 cu yd struck capacity. These are drawn by tractors 130 hp or more drawbar pull.

High speed wheel type units using either scrapers or wagons comprise the long haul work area of equipment. The most important contribution of the rubber tired units is speed. Therefore, for most efficient and economical use, it is necessary to maintain good haul roads and keep adverse grades to a minimum. The rubber-tired units are necessarily push loaded by a tractor to get maximum load in economical times and distance, for their draw-bar horsepower or rimpull is not sufficient to self-load to capacity.

In summation, the work limitations of the equipment have been described as (1) the maximum power zone in which work is done by track type tractors, and a maximum distance for production bulldozing up to 300 ft; (2) the track type tractor and scraper, in the second zone, hauling material on adverse grades, poor footing and short hauls up to perhaps 1500 ft one way; and (3) the high-speed hauling zone, varying from 500 ft one way up to almost any required haul length.

Coal Haulage Costs



By A. S. McCLIMON
Manager Sales Development
Euclid Road Machinery Co.

IN observing and discussing coal haulage in strip mining, it seemed there might be benefits to all concerned if an investigation were made to provide some actual haulage cost comparisons. Each mine knows its own historical cost figures, and can project its costs for future operations. Accordingly, actual haulage costs and production figures were requested from 20 bituminous coal strip mining companies, representing a total tonnage of 24,810,000 tons, and including 103 haulage trucks of 20 to 45

tons payload capacity. These data revealed an extremely wide variation in the ways and means various companies adopt to tabulate haulage costs.

The variation in cost systems made it impossible to tabulate completely and arrive at these over-all patterns. Therefore, only the broad outlines of haulage cost figures are given. A detailed comparison would show discrepancies, from one mine to another. Let this be the first conclusion: Haulage costs from one mine to another are not completely comparable, even though operating conditions appear practically the same. This is due to different cost accounting methods, and interpretations as to what should be included in costs.

Do the operating data show that the larger capacity haulers are being applied on the longer hauls? A breakdown of the number of trips per hour obtained by three different sizes of hauling units at 15 different mines shows some similarity in the 25-ton, 30-ton, and 40-ton class. Each size of hauler shows from one and one-half to four trips per hour. However, most of the 25-ton units make two to four trips per hour, while most of the 40-ton haulers make one and one-half to two trips per hour.

Since the performance, or power-to-weight ratio of these two sizes of coal haulers is practically the same (462 lb of gross weight per horsepower), it may be assumed that the larger sizes make fewer trips per hour because of longer hauls. However, the overlapping pattern of number of trips per hour between each of the three main sizes of coal haulers may suggest that length of haul only, without considering other factors, does not determine the best size of coal hauler to apply.

What is the range of actual cost per ton figures for 20-25-ton coal haulers, and how does this compare with the cost per ton figures for the 32-40-ton coal haulers? The cost per ton for seven mines using 20-25-ton units range from 7.3 cents to 21 cents per ton. The cost per ton for the 32-40-ton units at eight mines ranges from 6.6 cents to 21.7 cents.

It can be seen from these fragments of haulage costs from part of the bituminous coal fields, that a large capacity coal hauler does not automatically lead to lower haulage cost per ton.

The hauler must be carefully fitted to the individual mine requirements, including length of haul, pit space to work in, size of loading shovel and balance of haul units to the entire operation to keep the shovel, trucks, and tipple supplied steadily. Theoretical studies and some actual job records would seem to indicate that we are very close to the economic limit on size of hauling units, under present-day conditions, and that there is much to be gained by using more efficiently the proven and well-seasoned haulage units available.

"Are we doing as good as we have to do?" Nineteen bituminous mines report total of $3,249,400 spent on haulage for 23,577,700 tons, or about 13.5 cents per ton average—and this undoubtedly does not include all elements of the haul costs, due to variations in reporting figures for this survey.

Truck Haulage of Overburden and Coal

By RALPH H. KRESS
Executive Vice-President and General Manager
Dart Truck Co.

SUCCESSFUL development of torque converters has made it practical to climb much steeper hills than with the standard type of transmission. The result of this, of course, has been to greatly shorten the truck haulage distance, as it is now possible in some cases to climb grades as high as 20 percent, without gear shifting. At present there are two types of torque converters in successful operation. One is the single stage with a torque multiplication of approximately 3.5 to 1.00. The other is the three stage type which has a torque multiplication capacity of 5.00 to 1.00. The three stage converter also has an added feature which enables it to act as a brake when descending hills. With this three stage converter, it is quite possible to take a well-designed truck with adequate power over a 20 percent grade fully loaded, without any gear changes and also descend this 20 percent grade with the empty truck without using conventional friction brakes.

If the coal company maintains its own haulage road for coal from the pit to the plant, it should use as large a haulage unit as possible. Generally, the lowest cost operation units are those of 50 to 60 tons and as high as 70 tons on one loaded truck and trailer.

In this heavy haulage equipment it is necessary to use springs under the truck and trailer. These will help absorb the shock on the tires and the frame of the truck and trailer from the large shovel dumping into the body. One very important factor with the use of springs is the reduction in road maintenance. If a two stage spring is used the first stage will support and cushion the empty truck and trailer so it will make a smooth and easy ride on the return from the tripple to the strip pit. When the truck is being loaded, the shock from the first few buckets of coal dumped into the body is absorbed by the first stage springs which are quite flexible. Then, the second stage spring becomes effective and both springs carry the load when transporting the coal from the strip pit to the tipple. This will enable the operator to drive at a much faster speed over rough ground in the strip pit and there is far less abuse on the truck and roadway.

Bucket and Dipper Trends

By JAMES D. REILLY
Vice-President
Hanna Coal Co.

MANUFACTURERS' engineers, operating engineers of the coal companies and metallurgists of the steel corporations, have, with their combined efforts, made possible the trend to larger buckets and dippers. In discussing the points which must necessarily be correlated with larger buckets and dippers to give us the greatest economic return possible, it seems that we can find out about the future by delving a little into the past. One of our shovels, which has been in operation for 34 years, was purchased for iron ore stripping on the Mesabi Range and later was transferred to coal stripping. When purchased new, it had a dipper capacity of six cu yd. Since 1947 it has been converted to a 12-cu yd shovel. This was made possible by the reduction in weight of metal used in the buckets, the improved engineering and the reinforcement of other phases of the shovel. This machine is now running with less down time than at any time in its history. The yardage increase has come within 80 percent of the increase in the size of the dipper. This is an extreme case

but it points out what can be done with old equipment when proper study and engineering talent is applied.

To expand the thought to larger type shovels, 35-yd machines have been converted into 46 and 50 cu yd dippers. By constant effort to use every advance in metallurgy, imagination and courage, we have heightened the trend to larger buckets and dippers. We have seen the expansion of dragline buckets up to 35 cu yd, and coal loading shovels converted to nine and 10 cu yd buckets, this usually being determined by the number of passes required to work out best with the size of the haulage unit used in the pits.

Thought must be given to the other factors which are necessary to make any of these changeovers possible and successful. Unless there is a corresponding increase of efficiency in the blasting practice and the fragmentation of the material to be removed, in most cases instead of moving additional yardage and getting a lower operating and maintenance cost, the result will be just the opposite—there will be a loss of yardage and increased maintenance.

Another group who has spent considerable time and effort on the improvement of the down time on the machinery is entitled to claim some of the increased efficiency. The maintenance crew, by planning and job study, decreased the average time for changing the dippers from 14 hr to five hr; to change a crawler, which was a standard eight-hr procedure, they decreased the time to two hr; a hoist rope change improved from 2½ hr to ½ hr; boom cable changes from 16 hr to five hr.

Another factor which must be given consideration is the psychological effect on the shovel operators. Management gives each shovel operator a report on shovel performance, showing down time, yardage, yards per hour and the cubic yards per pass. This tends to create a competitive spirit resulting in increased yardage.

We cannot over-emphasize the remarkable job done by the manufacturers and the mechanical and electrical engineers in the field. To achieve a goal of this type it takes the organization and team work of all groups. Our objective here is to contribute ideas that will increase the efficiency of our operations.

Bucket and Dipper Trends—1953

By A. F. BUSICK
Vice-President in Charge of Engineering
Marion Power Shovel Co.

IN MAY 1947, it was my pleasure to describe to this group the design of the first 40-cu yd dippers used on stripping shovels. These dippers were constructed of modified armor plate steels. By using this steel instead of ordinary high strength steel in the dipper and handle, enough weight reduction was made to allow us to install 40-cu yd dippers in the place of 35-cu yd dippers previously in service without increasing the loads on the shovels.

After some field experience with these it was felt that further reductions in weight could be accomplished by a redesign of the back and door. Accordingly, a 45-yd dipper was designed and built in 1948 and during the following year two additional 45-yd dippers were put in service. Each new dipper incorporated improvements in lip construction although the remainder of the dipper was not altered appreciably.

U. S. Steel Co. then developed an improved alloy plate which they now market under the name of "T" steel. In the quenched and tempered condition this steel has a yield point of 90,000 psi, an ultimate strength of 105,000, 18 percent elongation and 55 percent reduction of Area. This was first used in a lip in 1950 and has been standard with us since then.

The 45-yd dipper design had an extremely rounded front with curved lip which was adopted on the basis that it would provide a better filling dipper. This was evidenced by the fact that a better dipper factor was obtained in service than on the previous 40-yd units.

The latest development in the large dipper has been a further modification of the lip design, having the tooth bases butt-welded to the leading edge of the lip instead of overlapping it. After welding, the joint and adjacent areas are ground so as to obtain a smooth surface free of any minor irregularities which might cause failure from stress concentrations. Experience so far indicates it may be the final design.

A number of modified armor plate dippers are in use on stripping shovels for the following sizes: 10, 15, 18, 20, 22, 30, 35, 38, 40 and 45 cu yd. We have experimented with this steel on loading shovels in copper and iron ore and soon found that whereas the dipper fronts gave very satisfactory life, the abrasive qualities of the ores caused premature wear. We have, therefore, developed dippers with cast manganese fronts and modified armor plate backs, doors and bails for this class of service. These dippers carry a greater pay load for a given total weight than others of equal strength.

Some Aspects of Bucket and Dipper Maintenance

By R. M. DICKEY
Sales Manager-Large Machines
Bucyrus-Erie Co.

PROPOSALS to increase the dipper or bucket size on a given excavating unit at once bring to mind the possibility of overloading or overstressing the machine by so doing. However, such terms as "overloading" or "overstressing" are purely relative. Dipper and bucket sizes and operating ranges for individual excavators are established by the manufacturers. Among these manufacturers there naturally exists a certain amount of variation in belief as to how much loading a machine can withstand with maintenance costs and output satisfactory to both user and maker. Past experience is ordinarily the governing factor, since it is improbable that any individual or organization can calculate accurately the operating stresses to which an excavator is subjected during its life.

Repeated application of stress to metals causes fatigue and ultimate failure. An excavator may in its early years stand up to high fatigue stresses but in later years require considerably more maintenance than would a unit in which the stress levels have been kept lower throughout its life. It is certain that, of two identical excavators, if one is stressed higher throughout its existence, the cost of maintaining it will be greater. Conversely, it would be unwise for an excavator manufacturer to be ultra-conservative in rating machines merely to minimize maintenance costs because of the resulting adverse effect upon output.

Having established recommended load ratings, the actual dipper or bucket sizes and the operating ranges are not factors if the allowable load ratings are not exceeded. The obvious manner in which to increase dipper or bucket sizes without exceeding the manufacturers' recommended

loadings is to go to lighter construction. The weight saving in the dipper or bucket is then used in increasing the pay load.

Dippers or buckets may be lightened in two ways. One is to continue using the same materials, but to use less of them—to decrease plate thicknesses and casting weights and sections. The other way is to preserve the material strengths by using alloys of greater strength which permit decrease in weight without loss of durability.

How far we can go in continuing these increases remains to be seen from field experience. The physical properties of alloys as determined in the laboratory are not necessarily an indication of the manner of their functioning in the field.

Bucket and Dipper Trends

By PAUL V. LARSEN
Chief Engineer
Construction Equipment Div.
Electric Steel Foundry Co.

MANUFACTURERS of dipper and dragline buckets must constantly keep abreast of the modern designs being developed in the shovel and dragline industry.

Today's dippers and dragline buckets have many improvements. The all manganese steel dipper, so successful in the past, is still very much in demand. However, some coal operators prefer the newer combination cast and fabricated dipper. The cast fabricated dipper being lighter in weight is often used to handle extra yardage. The all cast dipper is generally conceded to have lower maintenance cost while the cast fabricated is more easily maintained in the field.

The modern stripping dragline bucket is the result of the same progressive engineering and newer fabricating procedures reflected in dipper construction. Some years ago dragline buckets were designed with narrow lips, long baskets, and low arches. It soon became apparent that modification of design to improve efficiency was necessary. As a result, the modern stripping dragline bucket has, as a class, a much wider lip, shorter basket, and higher arch than its earlier prototype. The result is that the modern, wide stripping dragline bucket loads and dumps more efficiently and has increased total yardage moved in most instances.

Over the years special coal loading dippers have been developed. These fabricated coal loaders are very wide in comparison to standard dippers. They are designed with flat lips and long teeth to load maximum amounts of coal with minimum amounts of dirt. They are fabricated of plate, and are, by comparison, lightly constructed to gain greater capacity—on an average 35 to 50 percent more than standard dippers. These coal loading dippers weigh from 18 to 35 percent less than all-cast dippers of the same capacity.

Coal operators should forever keep in mind that the bucket or dipper for the conditions will pay a larger percentage of profit on the total machine investment. These tools can make or break a closely figured job.

The old controversy of riveted vs. welded buckets is still a daily discussion among strip operators. Both types are still in demand and have their favored features. The riveted bucket still offers a flexibility that is difficult to build into the welded bucket. The riveted bucket, in spite of its demand, continues objectionable to strippers who do not have adequate riveting facilities at their disposal. The greatest feature of the welded bucket is that it can be completely overhauled or rebuilt with comparatively inexperienced help, as long as they have acquired the art of efficient welding and burning.

Development and design of dippers and dragline buckets is a highly specialized technique. There are no text books on the subject in libraries. Engineering theory and metallurgy work hand in hand with field experience to accomplish improvements, and the coal operating personnel, has contributed much toward the development of today's modern equipment.

Dragline Bucket Selection, Use and Efficiency

By CHARLES J. POLINEK
Assistant to President
Page Engineering Co.

THE trend in the last ten years has been toward the larger dragline of 10 cu yd capacity and larger. At the present time, in the United States alone, there are about 26 electric draglines of the 20, 25, 30 and 35-cu yd capacity models either working or on order for near future delivery. All but two are engaged in coal stripping operations. There are about 67 more diesel and electric walking draglines of the 12 to 17-cu yd sizes, with 78 percent working on coal stripping jobs.

Too many owners do not fully appreciate the difference in dragline bucket performance. Many capable operators give a lot of consideration to the type of dragline machine, but only casual consideration to the type of bucket best suited to the work it must do. In order to justify its cost, the dragline must be equipped with a bucket that will start digging the moment it is pulled forward by its load line. It must take its bite immediately to such depth as will load the bucket within one, two or three lengths of the bucket itself. When this bite has been attained, the bucket must continue to load without going deeper. It must be designed so that the material will pass into the bucket rather than be pushed ahead of the bucket. The bucket must be so balanced that the material being loaded will fill the whole bucket, with little or no void space in the basket.

Balance also affects the digging action of the bucket so that less power is consumed in the final phase of the digging cycle. This means the bucket will, under power, start coming towards the surface after it has completed its load, thereby eliminating further power consumed by the machine while hoisting the bucket. The bucket must be designed so that this action is realized even well out under the boom. This will eliminate excessive spilling during the hoist. The ability to carry without dribbling or losing too much of its load, plus being able to dump promptly at such an angle that all of its load will discharge without striking the bucket arch, is a necessity. The teeth of the bucket must be set at an angle to aid in digging and not act as rake teeth, causing resistance; also this angle must be such that the line of abrasive wear on the teeth has a tendency to sharpen rather than dull the tooth point.

Improvements in Shovel Dipper Design

By KARL SCHNEIDER
Design Engineer
Harnischfeger Corp.

GREAT strides have been made in the design of power shovels. Improvements in performance and better response of the machine to the operator are the happy result. This gain in efficiency must not be lost in the application of a clumsy and unwieldly dipper.

The following conditions must be met by the efficient dipper.

(1) It must be able to enter the bank with a minimum of wasted effort.
(2) It must fill quickly.
(3) It must dump fast and clean.
(4) It must stand up under the most severe punishment with a minimum time-out for repairs.

Higher lip design entails higher stresses in the joint between front and dipper back. Various methods were tried to produce a satisfactory joint. The "S" line, or interlocking joint, has been used with great success. The bail lug casting interlocks with the dipper front and forms a link between the front, sides and back. It allows the bail to be placed at a convenient location, away from interference with the fill material. The skeleton-like form of the bail-lug casting affords ample opportunity for welding to the side plate. The cover plate over the bail lug casting follows the "S" line in the front and extends as far back as the outside lug of the dipper handle. Fork-like extensions of the front casting extend across the seam on the bottom. These are hidden below the lower side box, but are accessible to welding for top and bottom seams.

Maximum strength of the dipper back is achieved by addition of vertical box sections to the conventional top and bottom horizontal box sections. This is accomplished by bending the side plates along two lines to complete the box construction. Two welded seams are necessary to tie the joints together.

Dipper door design has undergone many changes. New ways have to be found to increase the life. Lately, dipper doors completely welded have competed with doors where hinges and door plates are pin connected for easy replacement of the door plate. A further step in this direction was taken by inserting heavy rubber bushings at the pin joint to absorb shock loads. These bushings are preloaded and an open area called the bulge area is provided to allow some displacement of rubber volume.

Snubbers in disk or band form restrain the otherwise free swing of the dipper door. The lower front of the dipper door must be provided with convenient ledges for wear surfacing. This becomes especially necessary when loading high. Door liners are optional and must be replaceable. Practice shows that some operators will add wearing surfaces to meet their particular job. However, caution must be taken not to increase the dead weight disproportionately. Replaceable dipper tooth tips are now available in many adaptations.

General Problems in Overburden Drilling

By FRED HORNE
Chief Blasting Engineer
Sinclair Coal Co.

IT has been only a few short years since overburden drilling was an operation requiring only time and simple and inexpensive equipment. Now drilling has become a serious and costly operation, requiring complicated equipment, expensive initially and to maintain. Reasonably good fragmentation can be obtained in some cases by placing the explosive close to the formation, but other strata, especially sandstone, require the explosive to be confined within the formation proper to produce satisfactory fragmentation. Credit should be given the explosives industry for having kept abreast of requirements and it can be said with comparative safety that anything that can be drilled can be well shot, provided, of course, that sufficient explosives are used.

Formations presenting difficult drilling problems, in order of the degree of difficulty are as follows: (1) sandstone, (2) niggerheads, (3) mud, and (4) limestone. Sandstone is hard and slow to drill, and its abrasiveness causes a great deal of maintenance on bits, heads, augers, and drills, and reduces the potential footage of bits used on dry rotary drills. In building up tools used to drill sandstone, the higher cost of the tungsten carbide or borium rods is justified over the use of some of the less expensive hard-surfacing rods. The cost of applying the borium is the same and the additional service more than compensates for the higher initial cost.

A small niggerhead can be drilled with a horizontal drill if the driller has the time and patience to keep changing teeth of bits until he cuts through it. However, the writer does not know of any horizontal drill that can go through a large niggerhead or a large concentration of small ones. Niggerheads can be drilled with a dry rotary but the rate is slow and bit life is short.

It undoubtedly sounds peculiar to refer to mud as being difficult to drill, but in horizontal holes it is sometimes necessary to drill parts of holes and sometimes full depth holes in mud seams. When the mud is quite wet no drilling difficulty is experienced outside of the messiness. However, where the mud is dry and stiff it fills up the flights of the augers.

There is a real challenge to the builders of dry rotary drills to build a horizontal drill for limestone and other hard formations that cannot be drilled horizontally with equipment now available.

At the Seminole Coal Corp., New Athens, Ill., a limestone formation three to 11 ft thick lays above the No. 6 coal seam. In some areas of the pit as much as two ft of black slate separates the coal from the limestone but in a great deal of the pit, the limestone is frozen to the coal or is separated by only two or three in. of slate. Above the limestone is nothing but sand, clay, and thick topsoil. This bank was drilled vertically for quite some period of time, using an auger to go down to or close to the limestone; then casing these holes and cutting the limestone with two churn drills—part of the time with a wet rotary drill—and then loading the holes before pulling the casing. This operation required a crew of 13 drillers and shooters working three shifts, seven days a week.

A horizontal auger type drill was built for the mine by the Mid-West Radiant Coal Co. This drill replaced all the vertical equipment and now, two shifts of two drillers each and two shooters working five and sometimes six days

a week, can easily stay ahead of the shovel. The maintenance on only one drill instead of three or four also leads to substantial savings and the digging has improved due to the displacement, as well as fragmentation, now obtained.

Horizontal Highwall Drilling

By MERLE H. BUSBY
General Superintendent
Ozark-Philpott Mine

OUR operation in Johnson County, Ark., is in stripping an area of metallurgical coal known as the Philpott Seam. The coal averages 17 in. in thickness and is being stripped to a maximum of 50-ft overburden. This consists of a clay topsoil, decomposed grey shale, hard sandy shale, with a hard dark blue shale lying just above the coal. The clay topsoil and decomposed grey shale together average about five ft thick. The hard blue shale immediately overlaying the coal also averages approximately five ft in thickness. The sandy shale begins at about the 20-ft cover and increases in thickness as the total overburden increases.

During the experimental stage of the overburden drilling a vertical water type rotary drill was used. The hard sand rock lying above the coal could not be drilled successfully by the vertical method. The lowest cost for vertical drilling was 70 cents per ft, too high for profitable operation. In going to horizontal drilling it was found that the dark shale lying just above the coal could be drilled with a Coalmaster borium tipped bit until 30-ft cover was reached. There the material got much harder and it became necessary to look for bits that would cut this hard material; the Hercules type sintered carbide tipped bits are proving very satisfactory.

Up to 35-ft overburden very good results have been obtained drilling six in. holes using the Salem cutting head. Above the 35-ft overburden up to 50-ft the seven-in. Coalmaster cutting head is used. Drilling cost using the electric and diesel drills for six and seven in. holes with the above mentioned bits and heads averages 14 cents per lineal foot.

The drilling pattern is set up as follows: Up to 35-ft overburden six-in. holes are drilled on 15 to 18-ft centers. Above the 35-ft overburden up to 50-ft seven-in. holes are spaced at 12-ft centers. Up to 35-ft overburden, the six-in. holes had very good results with Atlas Apex No. 1 40 percent weight strength; above 35 ft Atlas Apex No. 3 60 percent weight strength, low velocity powder is used.

Over-all drilling cost is one cent per cubic yard of overburden handled, and over-all loading and shooting cost is five cents per cubic yd of overburden handled. This makes a total of six cents per cubic yd which represents actual cost to date for drilling, loading and shooting. The over-all cost of drilling and shooting including depreciation and overhead is an average of $1.35 per ton of coal recovered. The rock and shale is being moved at the rate of approximately 4,000,000 yards per year. Seventeen yards of material per lineal foot of drilling, and an average of 3½ yards per pound of powder used are realized.

Horizontal Auger Drilling At Ayrshire Mines

By MARLIN CARTER
Superintendent of Drilling and Blasting
Ayrshire Collieries Corp.

AT present Ayrshire uses a Sullivan Stripborer, mounted on caterpillars and self propelled with reduction gear case driven by 30 hp electric motor. The holes are drilled 6¼ in. diam with augers 10 ft long. Drill crew consists of a driller and drill helper on each shift. Average footage per shift (six hours and 45 minutes) is 300 to 350 ft.

It has been past practice in this type of highwall, up to 50 ft high, to drill horizontal holes between the cap rock and limestone, 50 ft deep and 24 ft apart. However in banks higher than 50 ft it is necessary to drill horizontal and elevated holes. In this case, the low holes are 45 ft deep and 27 ft apart. High holes are 55 ft deep and 27 ft apart, but half-way between the low holes.

In horizontal shooting Airmite cartridges are used 3¼ in. in diameter and 21 in. long. In the low holes four cartridges are placed in the back, then three cartridges 20 to 24 ft from the mouth of the hole leaving a space between of eight to 12 ft. This makes a total of seven cartridges in the low hole. The high holes have 11 cartridges all the way to back of the hole leaving about 33 to 35 ft of open hole in front. Three 3¼ in. by 24 in. paper bags filled with drill cuttings are used for tamping. Three men load 12 holes in 25 to 30 min.

Auger drilling cuts costs immensely. First, the greatest saving is in drilling footage. It takes about twice as many vertical holes to uncover the same number of square yards of coal as it does in horizontal drilling. Second, tramming conditions are better in horizontal drilling where the equipment travels on the top of the coal.

There are conditions in banks higher than 50 ft where it isn't necessary to drill the high holes. For instance, if the top 30 to 35 ft consists of soil and stone that breaks easily, excellent displacement is obtained with low holes on 24-ft spacing.

Progress in Vertical Drilling

By ROBERT L. AKRE
Superintendent of Drilling and Blasting
The Maumee Collieries Co.

IN the early stages of its mining, Maumee followed the general pattern. Cuts up to 50 ft in depth were drilled horizontally and blasted ahead of the stripping machines. This practice often resulted in poor fragmentation and a tendency of the highwall to break and slide. Where conditions would not permit the use of the less expensive practice of horizontal drilling, vertical churn drills were employed to drill six-in. holes at first, followed by eight-in. holes and later the 10-in. holes of today.

Vertical holes in all cases permitted the drills to proceed independently of the strippers and to establish a buffer

area of shot overburden from 50 to 60 ft wide against which to make future blasts. This resulted in much better fragmentation and eliminated the tendency to cave the highwalls. The practice of making all blasts behind a buffer area is of such value that when box cuts are drilled and blasted in preparation for opening a new pit, they are always prepared 50 to 60 ft wider than the box cut will be, thus establishing the buffer area which will be maintained thereafter.

During the past two or three years, several manufacturers have developed rotary drills employing roller cone bits and compressed air to remove cuttings. However, these machines were all designed to drill holes smaller than ten-in. Since our interest lay in holes no smaller than ten in., Bucyrus-Erie was persuaded to design and manufacture a roller-cone compressed air machine capable of drilling vertical holes up to 12-in. diam.

In September, 1952, the first of these machines, designated the 50-R, was delivered to Maumee Mine No. 27 near Dugger, Ind., and immediately following its installation proved that such holes could be drilled at astounding rates of speed. The machine is a crawler type weighing 45 tons; mounts tandem compressors of 1200 cfm capacity; uses seven-in. diam stem in 33-ft sections above a five-ft stabilizer on which is attached a 10⅝-in. roller-cone bit. Rotation of the bit is by motor drive from top of stem. Down pressure is applied by a hydraulic motor. Dust blowing out of the hole with the cuttings is collected by a Roto-Clone dust collector.

This unit was designed to drill 10-in. vertical holes at rates up to 100-fph in the type of overburden existing at the Maumee mines. It has exceeded expectations in many ways. One day in February, 1953, operating on two 6¾-hr shifts with three men on each shift, it drilled 42 holes of 10⅝ in. diam to an average depth of 52 ft for a total of 2176 ft. The same crews loaded, primed and stemmed the holes and connected same ready for firing.

With each hole accounting for more than 1500 cu yd of prepared overburden, total yardage blasted was 65,280. On the same day, the 30-yd dragline following, in three shifts of 7¼ hr each, moved approximately 52,000 cu yd at the rate of over 2300 cu yd per hr. To obtain the same result in two shifts of drilling, four 10-in. churn drills, and approximately 26 men would have to be employed, based on previous experience.

In December, the 30-yd dragline moved in more than 1,000,000 cu yd, and the 50-R produced an equivalent yardage of prepared bank, working on the two-shift, 6¾-hr basis. Drilling cost per foot of hole was approximately nine cents, as compared to about 16 cents for the horizontal six-in. holes at this pit, and almost 40 cents for the 10-in. churn drill holes. Per cubic yard these costs were running eight mills as compared to 1½ cents for the 10-in. churn drills.

Vertical Drilling in Strip Overburden

By G. H. UTTERBACK
Chief Engineer
United Electric Coal Cos.

I DON'T know where the first horizontal drilling was done in open pit mining, but the first machine I ever saw was in one of the Sherwood Mines in Indiana.

As stripping machines got larger and better, the shallow stripping reserves disappeared, rock strata were thicker and higher in the bank and in many cases horizontal holes drilled from the pit could not be located for proper bank preparation. Furthermore, even though the rock may lie immediately above the horizontal holes, it sometimes becomes so massive that the explosive will not adequately break or displace it. Also the explosive charges are increased in size and power until finally the underlying coal is affected and the rock still not broken. At this point the harassed strip mine operator is again caught in a squeeze between high cost and poor bank preparation.

So we go back to vertical drilling. It may not lower costs but at least the rock is broken so the coal can be loaded without tearing up a million dollar stripping machine. Dry rotary vertical drilling has been used quite successfully in some locations where too-hard formations are not encountered and even combinations of vertical and horizontal rotary drilling have been used to combat the ever-present threat of excessive costs. But this is still not a good answer when beds of hard rock lie high in the bank. The explosive must be put in the rock if you have to do more than just shoot at it.

Roller bit and water flotation was the next step in the right direction and provided relief at a few mines, but this method was not widely accepted in the industry. Ingersoll-Rand built a big crawler mounted jackhammer called the Quarrymaster that did and still does an excellent job in the right location. But the best idea was still kicking around loose, clamoring for attention and probably getting pretty discouraged associating with people who had to be burned before they could see the fire. Apparently it is just another case of necessity being the mother of invention. I refer, of course, to the drill using the roller bit with compressed air flotation.

One of the big headaches with auger drilling has always been the time it takes to put on and take off the auger extensions. In this drill the hoist sheave on top of the mast is 91 ft 4 in. above the ground and the machine can drill a 73-ft hole without addition or removal of auger sections. The machine weighs about 80 tons and the levelling is done by 4 to 8-in. diam hydraulic jacks. The jack pads are 48 in. diam. Drilling rates are about 3.5 to 5.0 fpm in clay, 1.5 to 2.0 fpm in rock, 4.0 to 5.0 fpm in shale and slate.

At the mine where this drill is working the blasting is done with L.O.X. and since the holes must be loaded as soon as drilled they are being shot singly.

Improved drilling means improved overburden handling

MANAGEMENT

Fifty Years of Handling Labor Disputes

By THOMAS E. LARKIN
Umpire
Anthracite Board of Conciliation

THE Anthracite Board of Conciliation started in March, 1903. It formed the basis for a grievance adjustment machinery for settling labor disputes in and around the anthracite mines. During subsequent years it grew and expanded to meet changing conditions.

Rules on procedure were adopted by the Board of Conciliation in Wilkes-Barre on June 25, 1903. They provided a method by which labor disputes were to be processed first on company property and next before the Board of Conciliation. These rules can be summarized as follows:

(1) The individual employe or body of employes shall take up their grievances with the foreman at the mine, if not adjusted by the foreman, they are next to be taken up with the colliery superintendent. If not settled by the colliery superintendent within ten days, a written statement of the grievance will be submitted to the Board of Conciliation.

(2) The Board shall notify the coal operator of the grievance and request a written answer to same. The Board next reviews the case and, at its discretion, orders a full hearing on the dispute.

This Board was the start of a grievance adjustment machinery under a collective agreement and has continued to function successfully for 50 years in prosperity and in depression. While its work was far from satisfactory in early years, it laid the groundwork for the set-up as it exists today. Like all human organizations, the Board of Conciliation had to crawl before it could walk. Its development during the different stages of its growth could be divided into the following periods:

(A) 1903-1911. Adjudication of grievances between employers and employes under a weak labor organization.

(B) 1912-1928. Grievance committees at the mines assisting in handling disputes and the march to complete recognition of the United Mine Workers of America.

(C) 1929-1953. Handling grievances under business unionism with a closed shop, the check-off of union dues, and skilled District Union leaders to assist with labor disputes at the mines.

Based on statistical data, the work of the Board of Conciliation in these three different periods might be summarized as follows:

(1) On the average, around ten grievances were settled on company property to one sent to the Board of Conciliation for final adjustment.

(2) There were 6533 grievances processed by the Board of Conciliation in the last 48 years, between 1903-1951. Of these, 45 percent were withdrawn or adjusted. The Board itself disposed of about five percent of these disputes and one-half were referred to the Umpire.

(3) In the formative years of organizational unionism, between 1903-1928, the Board settled its largest portion, 12 percent, whereas under business unionism it disposed of 1.8 percent. The Umpire handled 38.4 percent under organizational unionism; and under business unionism between 1929-1951, 55.4 percent of the total grievances processed.

(4) Work of the Board of Conciliation was heaviest during the depression years of Period B. This was caused by a large decrease in anthracite employment. Considered percentage-wise, the changes from Period A to Period B in grievances over "Separation from the job" doubled; and disputes over consideration or make-up wages for contract workers increased almost three-fold.

The grievance set-up under the Anthracite Board of Conciliation is one of the oldest in the country. While it is not perfect, none works as satisfactorily for employe and employer alike.

Central Management vs. Unit Supervisory Control

By PAUL WEIR
President
Paul Weir Co.

MR. WEIR'S paper was received too late for an extract to be included in this issue. His full paper will appear in the 1953 edition of *Coal Mine Modernization.*

STREAM POLLUTION

The Stream Sanitation Panel was entirely extemporaneous and no written discussions were presented. However, a transcript of the session will appear in the 1953 edition of Coal Mine Modernization.

Satisfied workers are the best workers

An idle mine cannot be started up on a moment's notice

Trade Not Aid

Free Traders Lose Sight of Damage to Basic U. S. Industries Which Politics Would Cause

By JOHN E. KELLY
Consultant in Natural Resources
Washington, D. C.

AS every prospector knows, a back-breaking climb to the summit or pass all too often reveals a whole series of other peaks and ridges barring the way to the big bonanza. The American mining industry starved through the depression, surmounted the roadblock of L-208, submitted to throttling controls and favors to foreign mines, only to be confronted now by a vast bulk of propaganda for free trade.

While the American mining industry eyes the rising tide of red ink and works feverishly to preserve the mines, proponents of this new philosophy labor with equal diligence to convince the American taxpayer that "Free Trade" will eliminate the dollar gap and remove the need for foreign aid.

This is a powerful argument, but there is no promise that "Trade Not Aid" will repay any of the $41 billion spent overseas since the end of World War II. Nor is there any proof that it will substantially reduce demands for continuance of foreign aid.

Lead Provides Pattern

As between a domestic industry supporting the national economy and tax structure by heavy contributions, and foreign producers contributing nothing, reason and patriotism should dictate preference to the home industry. As the lead crisis shows, the question of imports is one of invasion of the domestic market. Where local production meets the demand, any imports replace and displace an equal amount of American output. No rhetoric can gainsay that. In 1950 the State Department reluctantly admitted that we could not give up part of our market to foreign producers without taking away that part from domestic producers.

The American tariff is attacked by the free traders as an obstacle to international commerce. But they are silent about the much greater barriers to shipments, a multiplicity of quotas, blocked currencies, embargoes, anti-American discrimination, licensing, exchange restrictions, money values changeable as chameleons, infesting nearly all overseas nations. France is restoring tariffs.

Need Mining Industry

"Trade Not Aid" will in some magical manner increase sales, we are told. If the idea is to sell, is it not better to sell to highly paid Americans than to low-wage workers overseas? When American wage-earners are jobless because of the invasion of their market by imports, who gains?

A fundamental truth overlooked by the advocates of "Trade Not Aid" is that no modern nation can remain strong or secure without a healthy, producing mining industry. Before us is the example of Britain, plagued by surplus labor and weakened by continual unfavorable trade balances since coal and iron ore, the twin pillars of England's economic edifice, lessened in output. Those who would destroy American mining by advocacy of trade policies fatal to national security, might with equal logic demand liquidation of the defense establishment. Unless backed by the output of our mines, American armies could not fight. When on the outbreak of war a curtain of hostile submarines cuts off the highly-touted imports, it will be futile to expect the rehabilitation of abandoned domestic mines to keep pace with atomic warfare. On the average, 18 months is required to get a mine into production.

Lose Trained Men

Greater even than the loss of equipment in a mine closed by economic pressure is the loss of manpower, of the trained team that knew the mine and its orebodies. Miners scattered into other industries and far from their base rarely return when operations resume. The inroads of residual oil have already cost the jobs of 30,000 coal miners. Frank Jordan estimates that nearly half of the nation's presently unemployed are miners. Establishment of the "Trade Not Aid" program as national policy would add greatly to these disastrous totals.

"Trade Not Aid" publicity makes it appear that few if any foreign goods or materials hurdle America's tariff walls. Actually a large portion of imports arrive free and the total of dutiable and free imports in 1951 amounted to $10.8 billion. This is

probably as much as America can import without prejudicial economic dislocations. It compares very well with a 1951 export total of $15 billion, when America's world role and activities are considered.

Who Will Suffer

Dr. H. S. Piquet of the Library of Congress estimates in a forthcoming book that an additional $2.6 billion could be imported if free trade were established. Recording 1951 mineral imports of $1.5 billion, 13 percent of domestic production, Dr. Piquet postulates that further inroads of this proportion would be made were tariffs abolished to admit $2.6 billion of additional foreign produce. Other victims of "Trade Not Aid" are listed as wool, sugar, dairy products, cattle and meat, fisheries, linseed oil, and watches.

"Trade Not Aid" therefore would consist in practice of the export of American *hard* goods at the expense of consumer items and notably of minerals and ores. With this in mind, the identity of the advocates of "Trade Not Aid" becomes significant. Apart from the professional publicists and "do-gooders" staffing the pressure groups, most of the names associated with the free trade drive are those of men whose organizations stand to gain from greater export of their wares.

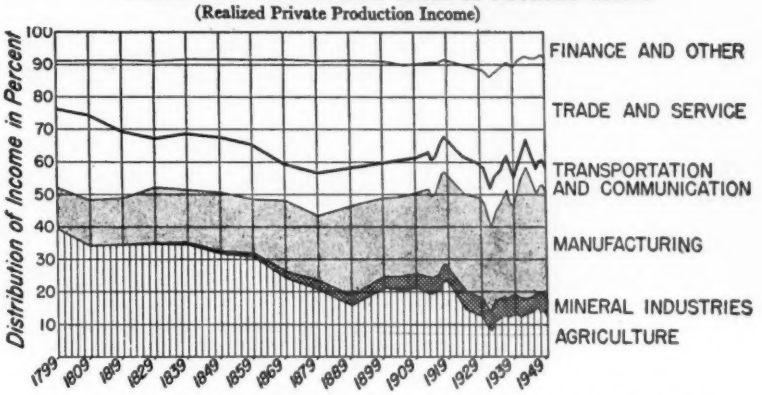
American automobiles have no real competition worldwide. With a domestic market approaching the saturation limit of annual turn-over, the competitive drive for ever greater output turns motor executives' thoughts perforce overseas. But shortage of dollars in the NATO countries limits sales. If they could be earned by mass shipment of foreign ores and consumer goods, the delighted recipients would hasten to invest them in new American automobiles. It is not surprising therefore to find motor tycoons and trade associations backing "Trade Not Aid."

Is such a policy short-sighted? What does Detroit owe to the American mining industry? How does the total of automotive vehicles owned by the industry and its employes compare with the foreign market (a region of few roads and 80-cent gasoline) that might be stimulated by dollars won from imports competitive with American agriculture and mining? Closed mines and jobless miners buy no cars, not even jalopies.

Source Of All Wealth

All wealth is created from the earth by agriculture and mining; all other industries are but processors and middlemen. A nation dependent upon

DISTRIBUTION OF NET NATIONAL INCOME BY INDUSTRIAL CLASSES
(Realized Private Production Income)



All our national wealth stems from the earth through mining and agriculture

imports and fabrication is at the mercy of those supplying its primary needs. The arguments for stockpiling apply in astronomical ratio to the maintenance of a mining industry in being. The problems of national survival and prosperity in a world torn with hatred and political passions require urgently the collaboration of those whose lives are devoted to the production of metals and minerals. Yet some organizations which seek to chart the course of mineral development and usage, proclaiming their policies to be "In the National Interest" can flout national safety by advocating policies that would destroy domestic mining:

> "The policy of the United States should be to encourage the production of metals and minerals in this country and abroad and to assure the access of American industry to the output of other countries on the most favorable terms possible, so that adequate low-cost supplies are at all times available to this country. This policy requires the opening of the American market to foreign producers of metals and minerals on a non-discriminatory basis. Although present duties on metals and minerals are generally low, the existence of these duties in certain cases is not consistent with our need to draw a large and increasing proportion of our materials supply from foreign sources."

The inclusion of "in this country" above can be but lip serving, for elementary mathematics demonstrate that the cost of minerals bears a direct relation to the wage and tax components thereof. American tariffs close but part of the cost gap between native and foreign ores.

"Trade Not Aid" is a glib and plausible slogan. If bewitched thereby America levels her tariff walls and invites the dumping of foreign raw materials, often subsidized by authoritarian governments, a gray tomorrow may read the result: "Trade Not Security."

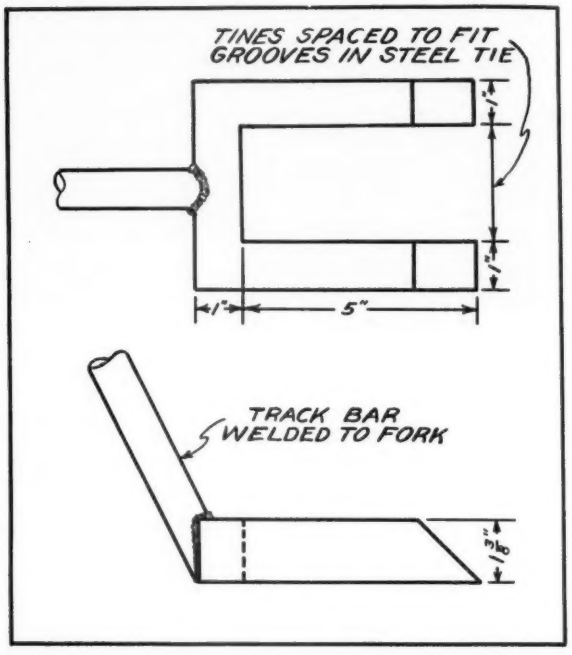
American miners cannot compete with cheap foreign labor

* "A Trade and Tariff Policy In National Interest," a report to the President by the Public Advisory Board for Mutual Security, page 51.

Operators Corner

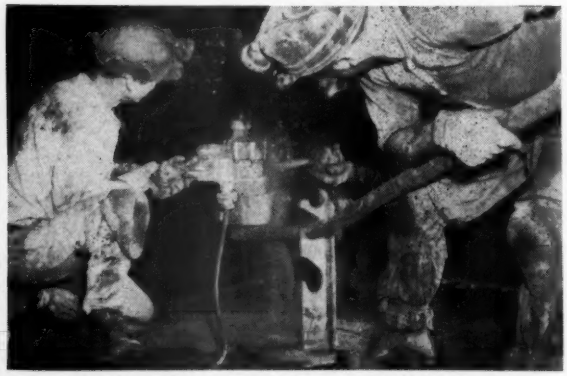
Fork for Steel Ties

A TIE FORK for use with steel ties has been designed by Albert M. Williams, an assistant foreman at Mine No. 58, Bethlehem Mines Corp., Marianna, Pa. A little ingenuity and some time at the machine shop produced a bar which makes it easier and quicker to lay prefabricated track. When using the bar in a bending jack, the long tines serve to protect fingers from injury in case the bar slips. Details of the tie fork are shown in the drawing on the left.

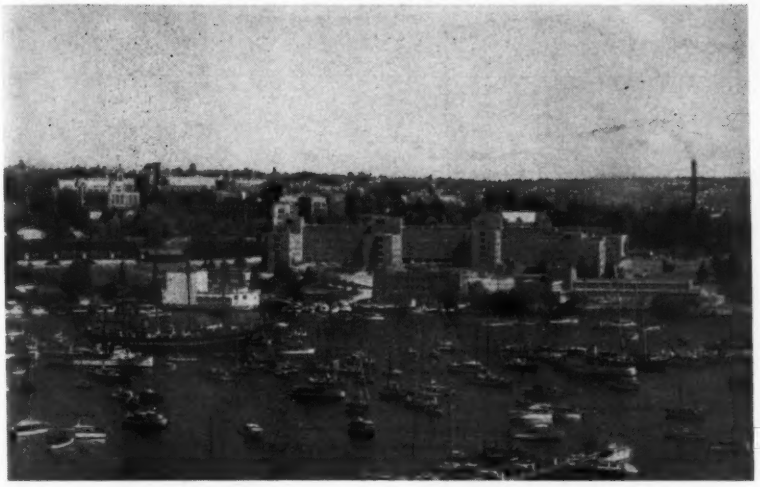


Improves Roof Drill Performance

A NEW and interesting innovation in using regular coal drills for roof drilling, particularly in low coal, has been developed recently by Anthony Schacikoski, general superintendent, Leechburg Mining Co., at the Park-Armstrong operation in Armstrong County, Pa. His idea is a variation of the lever and fulcrum adapted for use on a Jeffrey A-7 Drill. To drill a hard slate mine roof with a one-in. pebble streak running through it, the drill is forced by a six-ft. double strength steel pipe, 1½-in. in diameter, supported by a special ¾-in. steel plate fulcrum. A pan to cradle the drill is pivoted from the end of the pipe to steady and support the drill. The pipe or lever is first put into the lower notch of the fulcrum for drilling the first foot of hole. At this point, the rod is changed for drilling their full 29-in. hole and the lever is put into the second notch and the hole drilled up. Schacikoski states that by former methods roof at the Park-Armstrong operation was virtually impossible to drill by rotary methods and by using this equipment and Kennametal HFD 1⅜-in. Bits holes are drilled in about one minute each. Another practical feature afforded by this method of applying pressure to the drill is that the same crew can do the drilling and bolting, using the same drill for blast hole, roof bolt holes, and nut tightening.



Using a length of pipe and a homemade fulcrum . . . plus a little push at the right place makes roof drilling an easier operation at Park-Armstrong.



1953 Metal and Nonmetallic Mineral Mining Convention

State and District Chairmen Meet to Draft Program for Seattle Meeting

ABOUT the time mining men all over the country are reading this story, the State and District Chairmen of the National Program Committee will be gathered at a meeting in Seattle, Wash., called by Chairman Philip R. Bradley, Jr.

An outstanding program for the 1953 Metal and Nonmetallic Mineral Mining Convention to be held in Seattle, September 21-24, will be formulated at this meeting. Literally hundreds of suggestions as to topics and speakers will be sifted by the committee and plans for the actual convention lined up. A series of sessions will be designed to cover topics of paramount importance to those engaged in mining and processing ore and minerals. Not only will prominent legislators and leaders in government and industry be asked to speak on national issues, but also practical mining men will relate their experiences in the application of the new tools and methods that will maintain America's place in the forefront of world mining.

The frank exchange of ideas and information, for which American Mining Congress meetings provide the forum, will be of immense help to practical mining men in the months and years ahead. So valuable have these conventions become that many progressive mining executives have adopted the custom of sending considerable numbers of their key men—superintendents, engineers, geologists and others responsibile for daily operation and maintenance. They have found that participation in the various sessions, and the wide contacts with other up-and-coming mining men, pay off in better employe relations, renewed enthusiasm and new ideas.

Committees Busy

Plans for a smooth-running, successful convention require a lot of hard work and well organized, ably directed committees. Chairman of the General Committee is Robert M. Hardy, president, Sunshine Mining Co., aided by two Vice-Chairmen: Glenn Carrington, president, Glenn Carrington and Co., and Drury A. Pifer, director, School of Mineral Engineering, University of Washington. The important Trips Committee is headed by S. M. Strohecker, Jr., district manager, E. I. du Pont de Nemours & Co., Inc., and the "Salmon Derby" Committee is led by C. F. Holcomb, district manager, Thomas A. Edison, Inc. Chairman of the Welcoming Committee is Roy B. Earling, former vice-president, U. S. Smelting Refining & Mining Co. Joshua Green, director of Sunshine Mining Co., is Honorary Chairman of the Publicity Committee, and L. A. Williams, vice-president, Puget Sound Power & Light Co., is Chairman. Mrs. R. M. Hardy of Yakima, Wash., is Chairman and Mrs. Roy B. Earling, Vice-chairman of the Ladies Committee, which is planning a full schedule of events that will make the ladies' visit to Seattle a memorable one.

Th four-day convention will include three full days of business sessions devoted to general and operating subjects. Interspersed with the sessions will be the Welcoming Luncheon, the famed Mining Jamboree, a Salmon Derby and the Annual Banquet.

Field Trips Planned

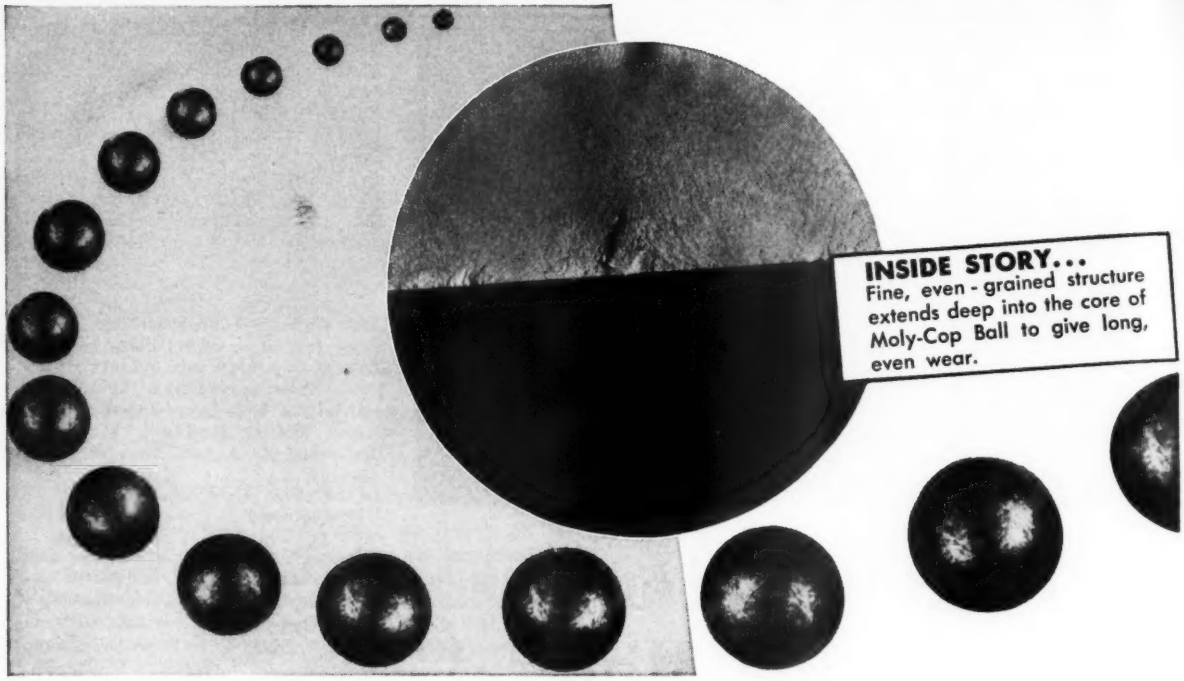
Immediately following the three days of sessions an all-day trip is planned for convention visitors and their ladies to Victoria, British Columbia. This capital city of Canada's westernmost province is noted for its beautiful scenery, flowers and peaceful quiet. Its Old World charm has gained it fame as a bit of England on the shores of the Pacific. But beneath its air of leisurely living there hums one of the largest industrial cities of British Columbia. Conventioneers will have ample time to see this charming city; investigate its shopping possibilities and enjoy the boat trip back to Seattle on the forest-edged waters of beautiful Puget Sound.

Additional attractions before and after the convention include a visit to the world famous Boeing Airplane Plant on Friday morning, September 25. This trip has been planned to allow plenty of time to make train or plane connections Friday evening. On Sunday, September 20, immediately preceding the convention, a morning trip has been planned to the Bremerton Navy Yard. The trip on Sunday afternoon to the University of Washington to see the School of Mineral Engineering and the U. S. Bureau of Mines Station will interest many convention delegates.

Make Reservations Now

Although reservations already received exceed the number of rooms promised at the Olympic Hotel, the Convention headquarters, Seattle, has many other fine hotels, and mining visitors are assured of first-class accommodations. Since attendance will be heavy, a letter or wire requesting reservations should be sent right away to the Seattle Hotel Association, 315 Seneca St., Seattle, Wash.

The Metal and Nonmetallic Mineral Mining Convention in Seattle, September 21-24 will be the mecca for miners in 1953. Plan now to be there. Don't delay another day.



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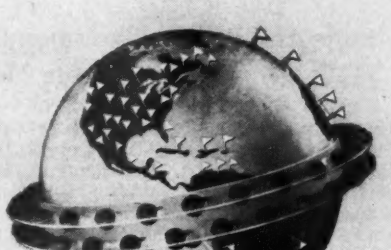
Tests have proved that Moly-Cop Balls wear up to 35% longer than alloy cast steel balls; up to 50% longer than best quality unalloyed carbon forged steel; and up to 120% longer than cast white iron balls. Considering initial costs and length of service, the net savings that result from the use of Moly-Cop Balls are substantial.



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Wheels of GOVERNMENT

AMC

As Viewed by HARRY L. MOFFETT of the American Mining Congress

"HOME SWEET HOME" is the theme song that Congress would best like to hear by late July, but doubts still exist as to the plans of the leadership either for a summer recess and another session this Fall, or for an adjournment until January, 1954.

Present indications point to Congress settling this year for less legislation than the Administration had originally scheduled for action. While nothing has yet been said officially, it is possible that no immediate Congressional action will be forthcoming on revision of the Taft-Hartley Act, extension of the Reciprocal Trade Agreement Act, or statehood for Alaska and Hawaii. All of these were called for by the Administration in January but appear about to be sidetracked. Differences between majority members of Congress and the White House are apparent; and the President, like some of his predecessors, may take his case to the country, in speeches at various points in the next few weeks in the endeavor to stir up grass roots support for his programs.

Officials of Government departments and agencies will welcome, with a sigh of relief, any early departure of Congress for home. They have had to spend much of their time before Congressional Committees, not only seeking funds to operate their departments, but also answering questions as to their position on a multitude of issues. A recess will permit them to get down to the task of reorganizing their agencies and carrying on the activities for which they were created.

T-H Act Changes in Doubt

Prolonged hearings before the House and Senate Labor Committees were ended on May 8 and April 30 respectively, but to date neither Committee has been successful in drafting a measure for revision of the Taft-Hartley Act.

House Labor Committee Chairman McConnell has announced that his Committee will thoroughly consider extensive revisions of the law, but no sessions for this purpose have yet been held.

The Senate Committee has before it a draft containing an assortment of amendments, prepared by the committee's staff. Some of these would strengthen the Act while others would severely weaken it. Chairman Smith states that the draft is merely "for consideration" and is not representative of the views of the Committee.

Actually, the situation on labor legislation boils down somewhat as follows: Labor unions seek weakening amendments or a return to the Wagner Act; industry seeks a strong storing up of the law; and members of Congress are reluctant to act as compromisers of these divergent views. No expression as to the Administration's desires has been sent to the Labor Committees, although it is reported that Labor Secretary Durkin has submitted several proposed changes to the White House which would weaken the Act and be unacceptable to industry generally. Both in and out of Congress there are many who believe that no action will be taken towards revising the Act before Congress recesses and possibly none at all this year.

Tariff Act to Be Extended

A determined drive has been made by the Administration, supported by its leaders in Congress, to obtain a simple extension of the present Trade Agreements Act for one year, during which period a thorough study would be made of U. S. foreign trade and tariffs. A measure providing for the one year extension, for the study, and for enlarging the Tariff Commission from five to seven members has been approved by the House Ways and Means Committee. This measure was introduced by Rep. Simpson (Rep., Pa.) after the Administration had indicated that it would not approve the original Simpson bill in toto. That bill would have extended the trade pact act for one year from June 12, 1953, and would have provided for a sliding scale import tax on lead and zinc, set import quotas on foreign residual oil, and strengthened the "peril point" and "escape clause" provisions of the law.

Simpson also has introduced a separate bill calling for the sliding scale import tax on lead and zinc and the other features of his original measure not contained in the simple one year extension proposal. No action has as yet been taken on this second bill.

Hearings on the original Simpson bill ended late in May. Numerous industry witnesses called for the measure's approval. Representatives of the lead and zinc mining industry painted a clear picture of the distressed condition of the domestic industry and called for the imposition of a sliding scale tariff on foreign imports. Opposition was registered by some segments of the industry; Administration witnesses also opposed this proposal and suggested that remedial action could be obtained through the escape clause procedure.

A strong plea was made for the provision to impose an import quota on residual oil by representatives of the railroads, mine labor, and the coal industry, including the American Mining Congress. The Mining Congress also urged the adoption of amendments designed to strengthen the "peril point" provision of the law, to make it mandatory that the President invoke the escape clause provisions of trade pacts where foreign imports

Washington Highlights

TAFT-HARTLEY REVISION: In doubt.

RECIPROCAL TRADE ACT: One-year extension probable.

MINING LAW AMENDMENTS: To curb abuses.

ECONOMIC CONTROLS: Standby controls on the way.

TAX REDUCTION: Unlikely this year.

SUBMERGED LANDS: Title to States.

SMALL BUSINESS: Western Hearings concluded.

ST. LAWRENCE SEAWAY: Still in controversy.

imperil domestic industry, and to restore the statutory rates of duties on strategic and critical minerals at the earliest possible date.

Mining Law Changes Sought

Several measures dealing with the mining laws are receiving attention by Congress. Most active of these is a measure introduced in the House by Rep. Wesley D'Ewart (Rep., Mont.) and in the Senate by Senator Henry Dworshak (Rep., Idaho) which has as its objective the elimination of abuses of the mining laws by those who locate claims for purposes other than legitimate mining activity.

This measure, which would apply to mining claims hereafter located, would (1) prevent, prior to patenting, the use of any such claim for any purpose other than prospecting, mining, or processing operations and uses reasonably incident thereto; (2) permit use of the surface of such claim, by the United States or its permittees or licensees for grazing or forest management, or access to adjoining land, so long as such use does not materially interfere with mining or related activities; (3) protect the rights of the mining claimant to cut timber for his operations, including the clearing of land for mine structures; (4) protect the established rights of existing claimholders; and (5) continue the guarantee of a full and clear title to both the surface and the mineral upon patenting.

Hearings were held before the House Mines and Mining Subcommittee on May 26, at which the Interior Department strongly endorsed the measure, and representatives of the mining industry declared that the industry could "live under the Bill." They also said that the Bill, if properly administered, would vastly reduce the abuses that have been complained of in widespread though misleading publicity in recent years. They pointed out that proper enforcement of the mining laws could and should have prevented the abuses from occurring, but recognized that the situation has reached a state where Congress might appropriately make a positive statement as to the mining laws such as contained in the D'Ewart-Dworshak measure. The Bill also received the strong approval of the American Cattlemen's Association, the National Wool Growers Association, and the U. S. Chamber of Commerce.

At the conclusion of the hearing, the subcommittee unanimously approved the measure with two minor clarifying amendments and reported it to the full House Interior Committee. The full committee ordered it reported to the House on June 2. It is expected that action in the Senate will await House passage of the measure.

Meanwhile, other measures are pending in the House Agriculture and Senate Interior Committees which would make drastic changes in the basic mining laws. These bills, sponsored by Rep. Hope (Rep., Kans.) and Senator Anderson (Dem., N. Mex.), would sever the surface from the mineral rights and impose harsh recordation requirements. They are being strongly opposed by the mining industry.

A House Interior Subcommittee has also reported favorably to the full committee the Regan Bill, which would remove sand, stone, gravel, pumicite, and cinders on public lands from acquisition under the mining laws and provide for their disposition solely under the Materials Disposal Act of 1947. This bill, which applies only to future locations, is likely to be amended by the full committee to remove pumice and pumicite from its coverage and to change the word "stone" to "common stone" or "common rock", before it is reported to the House.

Hearings have also been held in both the Senate and House Interior Committees on bills by Senators Millikin (Rep., Colo.) and Johnson (Dem., Colo.) and Rep. Aspinall (Dem., Colo.), which would permit the patenting of mining claims in areas held under oil and gas leases or prospecting permits, with a provision that the rights of patentees would be subject to such permits or leases. The measures apply largely to uranium prospectors and miners. At the House hearings, the Committee urged mining and oil industry representatives affected by the measure to get together with the Interior Department and to draft a bill that would cover the subject clearly and be acceptable to all concerned and to submit it to the committee for further hearings. Senate action is expected to await the outcome of this action.

Standby Controls in Offing

On the economic control front, the Senate has passed a measure giving the President power to invoke a 90-day freeze of wages, prices, and rents in an emergency. The bill carried an amendment, sponsored by Sen. Byrd (Dem., Va.), which provides that the President could invoke the freeze provisions only after a declaration of war or passage of a concurrent resolution by Congress. Another amendment provides that, preliminary to instituting materials allocations, both scarcity and hardship in the civilian economy must be demonstrated.

The control measure would also extend for two years Defense Production Act provisions for expansion of productive capacity and supply, including authority for the granting of loans, loan guarantees, the making of long-term contracts for minerals and metals, and the mineral and metal exploration and development programs handled by DMEA. The termination date on long-term Government commitments to buy strategic and critical materials would be extended one year, to June 30, 1963. The bill when approved by the House is expected to carry these latter provisions, but sentiment in the House is against the Byrd amendment.

The President's plan to reorganize and expand the Office of Defense Mobilization, submitted to Congress on April 2, met no Congressional opposition and went into effect on June 12. Under the plan, ODM becomes a permanent agency, and assumes the functions of the abolished National Security Resources Board as well as the stockpiling functions of the Munitions Board. The fate of the Defense Materials Procurement Agency and the Defense Minerals Exploration Administration are still in doubt, although it is expected that a skeleton force will be maintained to carry on the remaining functions of those organizations.

Tax Reduction Doubtful

With the Administration determined to place the United States upon a firm financial foundation before cutting taxes, it is unlikely that Congress will slash personal income tax rates in the near future. On the other hand, it is entirely possible that the lawmakers will extend the excess profits tax for at least another six months, as requested by the President and his tax advisors.

Attempts to bring the Reed personal income tax reduction bill before the House have met with defeat, and the leadership is determined that it will carry out the wishes of the White House with respect to taxes.

Hearings have opened on proposals to extend the excess profits tax, and despite some opposition to it, the outlook is for approval.

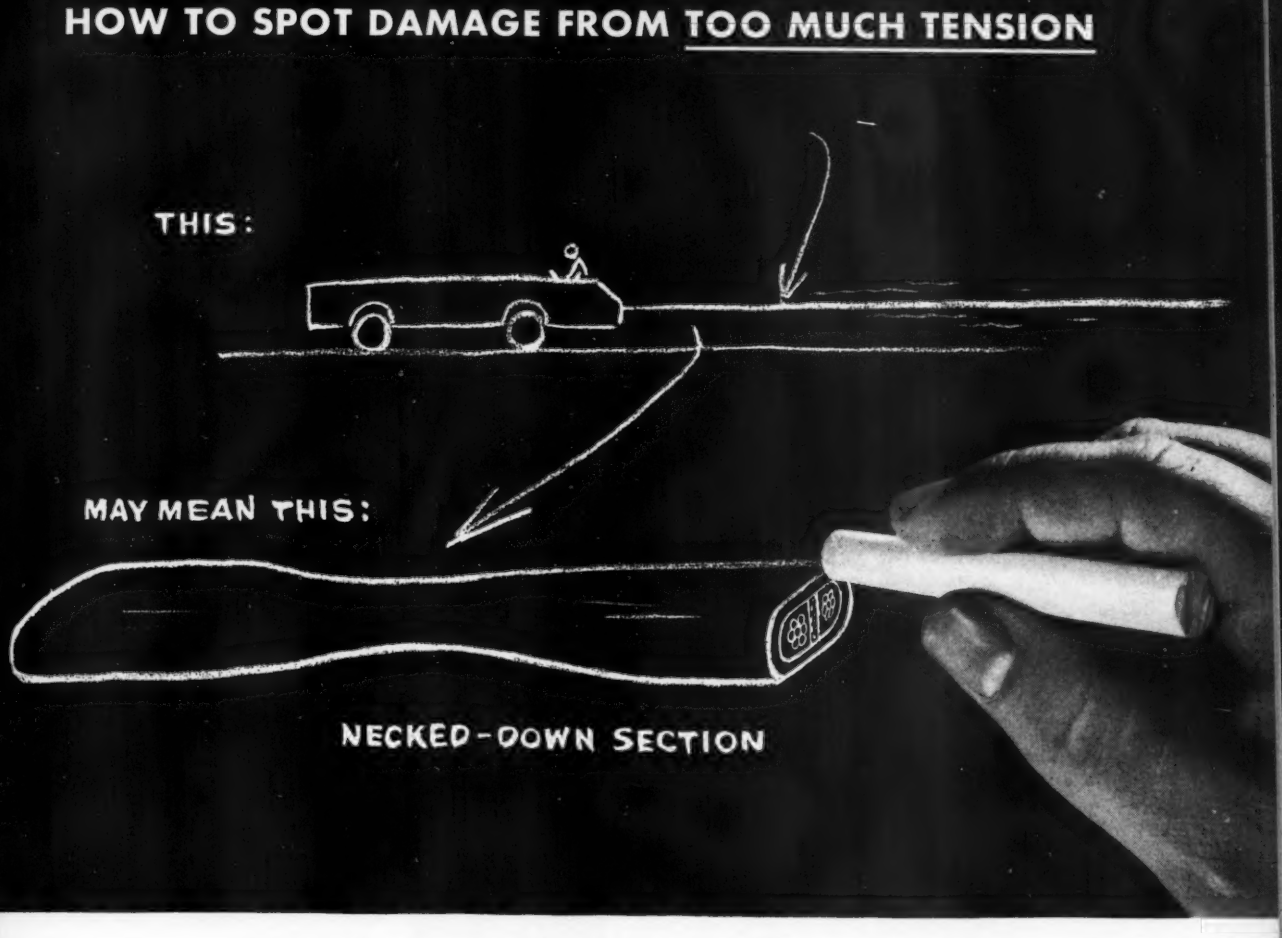
The House Ways and Means Committee will also get open hearings under way this month on a general overhauling of the tax laws. The staff of the Joint Congressional Committee on Internal Revenue Taxation has been holding a series of conferences with industry witnesses, including representatives of the American Mining Congress, looking toward clarification of the tax laws and the removal of inequities.

It is understood that the Treasury Department has undertaken a thorough study of the entire tax code and in cooperation with a large number of industry advisors expects to draft a complete revision of that code for submission to Congress next year.

(*Continued on page* 101)

MINING MACHINE CABLE

HOW TO SPOT DAMAGE FROM TOO MUCH TENSION



. . . AND WHY ANACONDA'S NEW BALANCED DESIGN ADDS SAFETY, LONGER LIFE TO CABLE

Necked-down cable shows overstretching. Jacket and insulation become thin, easily punctured. Moisture penetration or a broken ground conductor may make the cable hazardous.

ANACONDA'S ANSWER: BALANCED DESIGN

Tension devices help; but aren't cure-alls. An added safeguard lies in the balanced design of Anaconda's new mining-machine cable. Stretchability of the ground has been increased. It will not break before the power conductors. A new neoprene jacket has higher compression-cutting resistance and tensile strength. In the insulation more strength and moisture resistance are obtained from a cold-rubber base . . . similar to that used by tire makers to mold a tougher tire. Stranding, too, has been redesigned to make the whole cable more flexible . . . at no greater cost. You get less trouble from tearing, cutting, gouging and abrasion caused by rib-pinching, runovers and dragging.

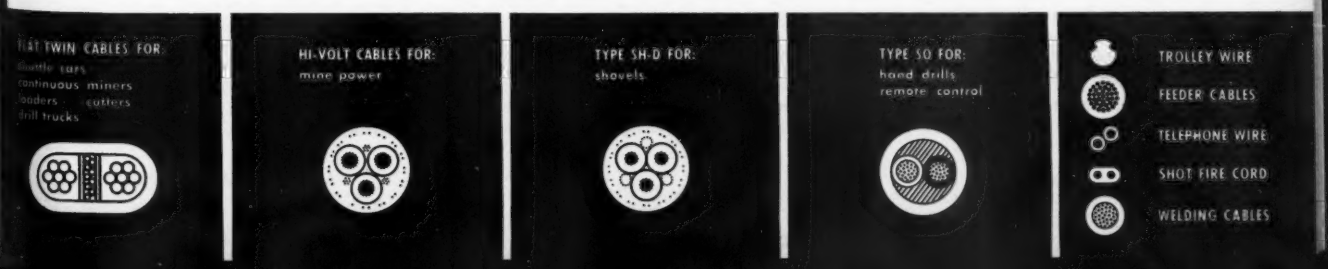
MUCH LONGER AVERAGE LIFE

In shuttle cars recently surveyed in 15 mines, ANACONDA Cables last 3 times as long as cables made only a few years ago. To learn why this is so, ask your nearest Anaconda Sales Office or Distributor for a sample section of this new cable. Examine it . . . take it apart. And remember that no ANACONDA Mine Cable has ever failed a U. S. Bureau of Mines flame test. *Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.*

53200

ANACONDA®

TODAY'S HEADQUARTERS FOR MINE CABLE



AMC Personals

O. W. Bilharz, president of the Tri-State Zinc and Lead Ore Producers Association since 1945, recently resigned. New association officers are **Harold Childress,** president; **Elmer Isern,** first vice-president; **H. G. Weidman,** second vice-president; and **Ward Ball,** treasurer. Childress, the new president is general manager of the Buffalo Mining Co. and the Mark Twain Mining Co., Picher, Okla.

The Western Pennsylvania Coal Operators Association recently elected **G. A. Shoemaker,** executive vice-president of Pittsburgh Consolidation Coal Co., as president of the association for the coming year. **Charles Baton,** president of Greensburg-Connellsville Coal and Coke Co., was elected vice-president. **Harry A. Sutter** was re-elected executive vice-president. **M. C. Briggs** was named treasurer and **Earl Glass,** secretary.

M. A. Hanna Co. recently designated **Earl S. Mollard** as general manager of the Hanna mining and smelter operations in the State of Oregon. Mollard has been assistant general manager of the Minnesota operations of Hanna since 1948. At the same time **E. Emmons Coleman** was named plant manager of the smelter. Coleman had been general anager of the Bradley Mining Co. electric furnace plant at Stibnite, Idaho, since 1950.

Grosvenor C. Dyar, former operating vice-president of the Smith Coal Co., Birmingham, Ala., has been appointed superintendent of the new Maxine Mine of the Alabama By-Products Corp., also of Birmingham.

Francis B. Speaker recently returned to Hewitt-Robins Incorporated, resigning his post as director of the Mining Requirements Division of the Defense Materials Procurement Agency. He was appointed to this position last year, succeeding Harold A. Montag, who returned to the Joy Manufacturing Co.

After long experience in the development and operation of mining properties in the Southwest and in Mexico, Speaker joined the War Production Board during World War II, where he served as an industrial analyst. At the war's end he joined the staff of Hewitt-Robins Incorporated, New York.

When the Korean conflict broke out, he was persuaded to return to government service in DMPA. He did so at great sacrifice to himeself and his company. As deputy director and later as director of the Mining Requirements Division of DMPA, Speaker's experience and understanding of the problems of the mining industry were amply demonstrated in his able handling of the industry's requirements for materials and supplies to keep the mines, quarries, mills and smelters operating.

The Sunday Creek Coal Co. of Columbus, Ohio, has announced the election of **Frank G. Smith** as president of the company. Smith succeeds **Chester H. Cook** who retired April 1, for reasons of health. At the time of his election Smith, who has been associated with The Sunday Creek Coal Co. for 20 years, held the position of senior vice-president of the company. He has been active in the American Mining Congress, as chairman of the Coal Division's Roof Action Committee.

Frank G. Smith

Edward W. Thornley has retired from his position as vice-president of the American Smelting and Refining Co., after 26 years' service, principally in purchasing activities. He served as vice-president of the company since 1934. He will continue to serve as consultant in connection with the proposed development of the Toquepala copper deposit in Peru, which will be mined by open pit methods.

Thornley was also president of the Asarco Mercantile and Mines Trading Cos., a director of Revere Copper and Brass Inc. and director of Mines Trading Co., Ltd., of London, England.

Francis H. Eichler will take over the purchasing activities of American Smelting and Refining Co. with the title of director of purchases. Eichler has been with the company for 27 years, recently as manager of the Los Angeles operations of the Federated Metals Division.

Election of **George H. Deike, Jr.** as a vice-president of Mine Safety Appliances Co. was announced by J. T. Ryan, Jr., president of the firm.

Deike has been with Mine Safety since his graduation from Pennsylvania State College in 1931 when he joined the company's engineering department. Since 1951, he has been director of engineering and secretary of the company.

He is also director and treasurer of Mine Safety Appliances Co. of Canada, Ltd.; assistant to the president of Catalyst Research Corp. of America; vice-president, secretary, and a director of Velocity Power Tool Co.; secretary and a director of M. S. A. Finance Corp. and secretary and a director of Callery Chemical Co. He is a director of the Sterling Seal Co. of Erie, Pa.

Behre Dolbear & Co. announced that **Dr. Elwood S. Moore,** Toronto, Ontario, has joined the organization as an associate.

Albert E. Forster was elected president of Hercules Powder Co. at a recent meeting of the board of directors of the company. He was also elected chairman of the executive committee.

Forster succeeds **Charles A. Higgins,** president and chairman of the board, who will continue as chairman of the board, a position to which he was elected in 1944.

Albert E. Forster

Forster has served as vice-president and member of the executive committee since 1951. He was elected a director of the company in 1940.

After 30 years as head of Sprague & Henwood, Inc., drilling contractors and manufacturers, Scranton, Pa., **James A. Ross** has been made chairman of the board, and in this capacity will remain active with the company. **Adrian E. Ross,** formerly assistant to president and chief engineer, has been elected president and **William J. Schank,** formerly vice-president, has

been made senior vice-president and general manager.

Three new vice-presidents were added to the Calaveras Cement Co. list of officers by the company's board of directors at its organizational meeting April 30. The three new officers are **E. M. Barker,** who has been manager of the company's plant at San Andreas, Calif., since 1947; **Mel J. London,** general sales manager, and **Arnold M. Ross,** who has been assistant vice-president since 1952.

Also announced was the appointment of **Grant Metzger,** mechanical superintendent, as acting manager of the San Andreas plant.

Ralph K. Gottshall was elected president of Atlas Powder Co. of Wilmington, Del., by the Board of Directors at its recent annual organization meeting. He was also elected chairman of the executive committee.

Gottshall, who is a director of the American Mining Congress, has served as executive vice-president of the company since May of last year. He has been a director and member of the executive committee since 1951. Prior to that time he was assistant general manager of the explosives department, having been promoted to that position from director of explosive sales.

The Board of Directors of The Cleveland-Cliffs Iron Co. have elected **Walter A. Sterling** president and member of the Board of Directors.

Alexander C. Brown, who had earlier been elected president and chairman of the board, continues as chairman and chief executive officer and **Edward B. Green** as honorary chairman.

W. A. Sterling

Sterling, who was born in Ishpeming, Mich., went to work in 1919 in the engineering department of The Cleveland-Cliffs Iron Co. at Hibbing, Minn., as a mining engineer. Three years later he left Cleveland-Cliffs to join E. W. Coons Co. as superintendent of construction. In the fall of 1929 Sterling rejoined Cleveland-Cliffs as superintendent of the company's Canisteo Mine at Coleraine, Minn. In 1940 he became general superintendent of the company's Minnesota mines; in 1947 he was promoted to manager of Minnesota properties, and in July, 1950, he was appointed vice-president in charge of mining operations.

By his election to the Board of Directors he succeeds **V. P. Geffine** as a member of the Board. Geffine continues as vice-president.

The Board of Directors of American Smelting and Refining Co. at their meeting on April 28 announced the election, as vice-president, of **Dr. Albert J. Phillips,** director of the Research Department.

Dr. Phillips, a native of Connecticut and graduate of Yale University, has been with the company since 1931, and has been director of Research since May, 1949.

Paul R. Paulick, consulting mining engineer of Library, Pa., has been retained to survey coal mining conditions in England. Purpose of the survey is to uncover ways to improve output with special emphasis on increased mechanization. Paulick has spent considerable time on similar missions in China, Japan, Formosa and in Europe. His present plans also include trips to France and Spain.

The appointment of **Charles S. Kuebler** to be assistant mining engineer of the Lehigh Navigation Coal Co., was announced recently. Kuebler joined the old company in 1938 as a special engineer in the mining department, and subsequently was cost engineer, tabulating director, and comptroller. He was Lansford District superintendent before being named planning engineer in March, 1951.

—*Obituaries*—

Clarence E. Abbott, a former vice-president of the Tennessee Coal & Iron Division of U. S. Steel, died April 14.

At the time of his retirement, Mr. Abbott was vice-president of Universal Exploration Co., a zinc mining subsidiary in Tennessee and vice-president in charge of special administrative duties for TCI.

From 1930 until the end of 1942, he was vice-president in charge of mining operations for TCI.

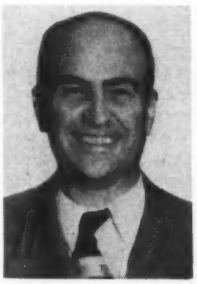
Alexander Bonnyman, Sr., coal operator in Kentucky, Virginia and Tennessee, died in Knoxville, Tenn., on April 15.

Mr. Bonnyman, 84, was president of Blue Diamond Coal Co. The firm's mines produced more than 7,000,000 tons of coal annually. A native of Scotland, Mr. Bonnyman came to the United States in 1870. In 1912 he opened his first coal mine near Hazard, Ky.

Col. J. Wilson Furness, 79, minerals authority and former chief of the minerals division of the Department of Commerce's Bureau of Foreign and Domestic Commerce from 1928 to 1934, died in Ashville, N. C., in February. A native of Philadelphia, he was a mining engineer and worked throughout the western United States, Canada and Mexico. In 1935, he was a member of the Minerals Advisory Committee to the War Department and the Mineral Policy Commission. In addition to the many government posts he held, Col. Furness was author of "World Minerals and World Peace."

Hugh Jay Beach, 60, president of the Flexible Steel Lacing Co., Chicago, died suddenly March 31 in his home in Glen Ellyn, Ill.

In 1912 he started working for the Flexible Steel Lacing Co. and in 1930 became president which position he held 'til his death. He was very active in every phase of the business and was an outstanding authority on metal fasteners for conveyors and transmission belts.



His many friends in industry were shocked at his untimely death. His capacity for work, his ideals of fair play, his ceaseless desire for good employe relations, as well as his ever present sense of humor won him admirers wherever he went.

Dwight D. Guilfoil, 66, vice-president and general sales manager of Sauerman Bros., Inc., died of a heart attack in his home in Chicago on May 3. He had been with Sauerman Bros., Inc., since 1913, except for a period during World War I, when he served in the Army.

Expressions from Our Readers

About "Periodic Mine Revaluation," *By S. H. Dolbear, January, 1953 Issue*

"THIS is certainly well done and should prod people to inventory their holdings periodically."—*Louis S. Cates, Phelps Dodge Corp.*

"OVER and above the questions of depletion and purchasing power of currency, you have stressed the importance of the fluctuating value of ore reserves according to market value and shown how technological advance could transform 'rock into profitable ore.' However, I wish that more could be said about what you call 'intangibles.'

"The Hoskold formula is known to most engineers, but I must say that the Parks formula, as described by you, gives a truer valuation of an orebody."—*K. C. Li, Wah Chang Corp.*

"THANK you for your interesting article on *Periodic Mine Revaluation.* No one will quarrel with your remarks about the necessity of such revaluation, in the light of our present tax set-up."—*Anton Gray, Kennecott Copper Corp.*

"IN my opinion, ore reserves can fluctuate so greatly due to the price of metals and, in many cases, due to the geological nature of the deposit, it is not economically feasible to lay ore reserves out too far ahead, and I think the whole matter is one that is up to the judgment of the companies involved in how they handle this controversial question."—*R. J. Mechin, St. Joseph Lead Co.*

"THE premise and the aims outlined in your article are very much worthwhile and would give a more correct portrayal of the value of what constitutes the major asset of a mining operation. However, there would be the very practical difficulty of each time having to go through the type of negotiation we were subject to in getting SEC to approve the valuation when we did include mine value in our balance sheet some years ago."—*F. O. Davis, Potash Company of America.*

"WE frequently have urged revaluation when there is a change in management. You go further in proposing that this be done periodically and in that I think you are right. Mining companies appraise their current assets at regular intervals but give scant attention to what in most cases is far more important, their reserves and development." —*Carel Robinson, Robinson and Robinson.*

"I have read your *Periodic Mine Revaluation* with interest and am sure you will be pleased to know that such revaluations are more or less routine with us.

"We are keeping reserves catalogued on a monthly basis and revaluations from the dollars and cents viewpoint are made as approvals for expenditures are requested for plant revisions. While we have not arrived at the solution in exactly the same way that you have, we tabulate annually current values and anticipated yearly profit before taxes for varying metal prices."—*Gloyd M. Wiles, National Lead Co.*

"THE continually increasing demand for mineral raw materials, coupled with the increasing difficulty of finding new deposits, places a responsibility on the modern operator to get as much out of his deposits as he can and in operating his mine to keep constantly in view the long-term objective of the recovery of the greatest amount of ore possible.

"If the operator is going to keep continuously before him the long-term mining program he will have to know periodically the changes that mining is making in the reserves that remain."—*E. H. Thaete, Jr., Freeport Sulphur Co.*

"UNQUESTIONABLY an inventory of ore, broken and in place, is a much more important factor than is an inventory of warehouse and other supplies in setting up the value of a property. It follows that ore reserves should receive appraisal at least as frequently as plant inventories are taken."—*E. R. Bennett, Empire Star Mines Co., Ltd.*

"I QUITE agree with you that present day financial reports are to some extent misleading in that the mineral property is often stated at a value much less than actual value based upon ore reserves. I do not agree, however, that it would be practical or advisable to attempt an annual valuation of the ore reserves to be used in the balance sheet. I have always contended that any asset on the balance sheet should be stated at cost, whether depletible or depreciable and that a proper or reasonably accurate writeoff be taken for depreciation and depletion each year with an offsetting credit to the reserve.—*L. J. Randall, Hecla Mining Co.*

"IT has always seemed to me that operating men had much to gain from such procedures, for they often reveal the places where changes might be made that would increase the value of the property."—*D. H. McLaughlin, Homestake Mining Co.*

"THE approach you have of *Periodic Mine Revaluation* is new to us but very interesting. We have used the Hoskold Formula in various ways and fairly extensively for the evaluation of new ore bodies, and feel that this type of calculation is a very good guide. By the same token, it would seem that your formula and its application would prove most useful in occasionally taking stock of ore reserves and production against reserves position." —*G. F. Jenkins, Asbestos Corp., Ltd.*

"I AGREE that valuation is important, and should be periodically corrected for the variable factors you mention."—*Worthen Bradley, Bradley Mining Co.*

"Yup Boss, you say for thirty years you worked in the mines and you don't know it all yet; well some people are like that"

Employes Continue Education

International Minerals & Chemical Corp. of Chicago, Ill., has adopted a plan to help employes who wish to continue their education, Louis Ware, president, has announced.

All regular employes of the company who have one year or more of continuous service are eligible to apply for assistance in paying for collegiate, professional or semi-professional education relating to the fundamentals of their work.

Under the plan, the company will pay half of their tuition, registration and laboratory fees for such courses in accredited institutions. Individuals taking graduate or advanced college level courses will also be allowed time off to attend classes up to six hours a week without loss of pay.

100 Year Celebration

The Societe de l'Industrie Minerale is planning a Mining Convention and Exposition at St. Etienne, France, in 1955.

On April 29, 1855, Louis Gruner, then director of the school at St. Etienne, called the first meeting of the society. The meeting scheduled for next year is to celebrate the centenary of that occasion.

The proposed meeting will include an exposition of mining machinery, world-wide in its scope, embracing the entire mineral industry. Also planned is a technical program covering the problems of the modern European steel industry; modern breaking and loading methods under longwall mining conditions; breaking and loading methods in room and pillar mining; modern mining; modern mining of strong beds; underground electrification, and new ideas in mining methods.

As the program develops, other sessions on the economic and financial problems of European collieries will be added.

Analyze Anthracite Deaths

Falls of roof, face, and rib continue as leading causes of fatal accidents in Pennsylvania's anthracite mines, the U. S. Bureau of Mines has said in releasing a detailed study of 1952 mishaps in the "hard" coal area.

The report points out that total fatalities from all causes, both underground and in stripping, was 99, compared with approximately 100 in 1951 and 92 in 1950. Falls of roof, face, and rib were responsible for 37 of the 93 underground fatalities last year, or 40 percent, but nevertheless were less frequent than in 1951, when they caused 46 percent of the fatals, and 1950, when they were responsible for 64 percent of the deaths.

Other underground fatalities in 1952 were attributed to haulage, 22 deaths (up five percent over 1951); rushes of coal and rock, eight; gas explosions, four; explosives, four; machinery, two; falls of persons, three; and miscellaneous causes, 13. Included in the miscellaneous category

were the deaths of five miners from an inrush of impounded water.

Commenting on the accidents, the Bureau said:

"This study of fatalities in and around Pennsylvania anthracite mines in 1952 reveals that management failure was responsible for 24 of the 99 fatalities; employe failure, 44; joint management-employe failure 16; cause undetermined, five; and unforeseen danger or unavoidable risk, ten.

"The study shows 84 percent of the fatalities resulted from human failure and could have been prevented," the Bureau continued. "The comparable figure for the fatalities due to human failure that occurred in 1950 was 71 percent and those in 1951, 69 percent."

A free copy of the report, "H. S. S. No. 417—Fatalities at Pennsylvania Anthracite Mines in 1952," can be obtained from the Publications-Distribution Section, Bureau of Mines, 4800 Forbes St., Pittsburgh 13, Pa.

Improve Coal Barge Harbor

Contract for improvement of the Harmar Coal Co.'s barge harbor on the Allegheny River at Harmarville, Pa., near Pittsburgh, has been awarded to the contracting division of Dravo Corp.

Twenty-five sheet steel pile cells will be installed. Two of these cells, each 26 ft in diameter, will provide foundations for an unloading crane and coal hopper. The balance of cells in the inner harbor will be constructed to provide for docking of coal barges for both loading and unloading.

In the outer harbor, which will have capacity for mooring 24 barges, a new 26-ft ice breaker cell and several barge mooring posts will be constructed.

AMC President Leaves DMPA

Howard I. Young resigned as deputy administrator of the Defense Materials Procurement Agency on May 14.

In 21 months under Mr. Young's leadership, DMPA contributed materially to the nation's defense and security by developing new domestic and overseas sources of strategic and critical materials vital to the defense effort. During its existence, DMPA has developed programs to expand the production of 17 metals and 24 nonmetallic minerals.

Of the metals programs, seven have been completed and all but two of the remaining 10 are 70 percent complete or better. Of the non-metals, 13 have been completed and all but three of the other 11 are 70 percent complete or better.

Howard I. Young

After a two months' European trip, Mr. Young will return to the American Zinc, Lead & Smelting Co., St. Louis, Mo., of which he is president. He served as deputy administrator of DMPA since September, 1951, when the agency was organized. Although he is returning to private industry, Mr. Young will continue to serve the Government as consultant when his services are needed.

New Plant for Refractories

Construction of a new refractory specialities plant at Janesville, Wis., having a capacity of 75,000 tons a year was recently announced by Norman J. Dunbeck, vice-president in charge of the Industrial Minerals Division of International Minerals & Chemical Corp.

Chief product of the new plant will be a granular refractory for air application in the patching of metal melting furnaces. This is the fourth plant of such refractory specialities to be erected by Eastern Clay Products Department of International's Industrial Mineral Division and is so located as to reduce freight rates and speed shipping services to an important segment of the market, Dunbeck said.

Coal Film Honored

Another mark of recognition has been given to the Bituminous Coal Institute's documentary motion picture, "Powering America's Progress," which has been awarded a George Washington Honor Medal by the Freedoms Foundation, Valley Forge, Pa. The medal—for outstanding excellence in the 16-mm. film field—was one of the Freedoms Foundation's annual awards for noteworthy contributions to a better understanding of the American way of life. Presentation of the top awards took place at historic Valley Forge on Washington's Birthday. Vice-President Richard M. Nixon did the honors. The medal to BCI will be presented at ceremonies in Washington next month.

This is the second honor bestowed on "Powering America's Progress," which last year received a certificate from the Film Council of Greater Boston for winning first place in the public relations section of that organization's annual film festival.

Coal Companies Merge

Stockholders of the Gulf Mining Co. and the West Gulf Coal Co., both located at Mt. Hope, W. Va., in separate meetings recently voted to combine the two mining operations. The daily production of the merged operations will be about 3000 tons. New officers of the combined companies are P. C. Graney, president and general manager; J. Y. Morgan, assistant to the president; P. M. Snyder, Jr., vice-president; Patrick C. Graney, Jr., vice-president, and D. C. Snyder, secretary-treasurer.

Skill Improvement Booklet

A revised edition of "Your Skill Improvement Program" has been issued by the U. S. Department of Labor's Bureau of Apprenticeship.

This 16-page booklet, designed to help the employer develop a skill improvement program, contains a check list for the employer's use in making spot evaluations of his current training system and training needs.

Copies of this new edition may be obtained from the Publications Branch, Bureau of Apprenticeship, U. S. Department of Labor, Washington 25, D. C.

To Mine Canadian Iron Ore

Plans now being drawn up by Fenimore Iron Mines, Ltd., are expected to make it the second iron producer in the Labrador Trough and the first at tidewater.

Recent reports of large independent American testing companies have confirmed estimates of the Fenimore management that it has a very substantial tonnage of iron ore close to or on tidewater, which can be mined, treated and delivered profitably to the eastern seaboard of the United States, H. A. Strain, chairman of the board, and Dr. J. A. Retty, president, have announced.

The tonnage and costs estimates mark the culmination of five years of exploration, and now the next step in Fenimore's operations will be the development of plans for production facilities, the announcement states.

In a letter to shareholders, Strain states that Fenimore has open-pit ore reserves of more than 500,000,000 tons, with other zones still to be explored; that the bulk of these reserves is close to or on tidewater, eliminating expensive railroad construction; and the ore can be mined, processed and delivered on the Atlantic seaboard and to Europe at a profit. The letter adds that based on shipments of 5,000,000 tons annually, the company is assured of a long-life property.

Fenimore has holdings on 300 sq mi in the northern section of the Labrador Trough, on Ungava Bay, which is navigable about six months a year. Prospecting and claim staking have been proceeding for five years, with more intensive exploration having been carried out on a year-round basis for the past two years. During the past four months, processing tests of the ore have been under way at the Battelle Memorial Institute of Columbus, Ohio, the Dorr Co. of Stamford, Conn., and American Cynamid Co.

Connor and Mittendorf Receive Service Award

THE highest honor of the Department of the Interior, its Distinguished Service Award, was recently awarded to Charles W. Connor, administrator, Defense Solid Fuels Administration, and Clarence O. Mittendorf, administrator, Defense Minerals Exploration Administration. Secretary of the Interior Douglas McKay presented the honor awards at a convocation in the Department Auditorium in Washington, D. C., on May 26.

Connor's award was for "outstanding leadership and devoted public service in furthering national security and defense." He has served as administrator of DSFA since December, 1950. The award read in part, "Under his leadership, the important expansion programs for metallurgical coal and coke capacity have moved forward, defense requirements have been met on schedule, and the readiness of the solid fuels industry to meet emergency needs has been assured."

Clarence Mittendorf received his award for exceptional service in furthering the national security with respect to metal and mineral resources. He came to the Department of the Interior early in 1951 as director of the Production Expansion Division, Defense Minerals Administration. When this agency was reorganized and redesignated as the Defense Minerals Exploration Administration in November, 1951, he was selected to head it. His award read in part, "Under his able leadership, the success of the exploration program has been demonstrated by a significant number of new discoveries in metal and mineral resources critically needed for the nation's defense."

Chas. W. Connor

C. O. Mittendorf

Wheels of Government

(*Continued from page* 92)

Tidelands Ownership Determined

After many years of controversy, coastal States were assured title to submerged offshore lands within their historic boundaries when President Eisenhower signed into law the bitterly contested "tidelands" bill on May 22. Both Houses of Congress are now working on measures to provide for Federal development of the mineral resources of the outer Continental Shelf.

During consideration of the latter measures by the Senate Interior Committee, AMC executive vice-president Julian Conover urged adoption of an amendment making "adequate provision for the exploration and development of sulphur and other potential minerals in addition to oil and gas." He recommended that Congress make it clear, in leases granted by the Federal Government on outer shelf areas, that the lessee of a particular mineral has no preference right to a lease for any other mineral within the area covered by such lease.

Small Business Hearings End

Hearings were held by the House Small Business Committee in Denver, San Francisco, Spokane and Phoenix on the many problems currently facing the mining industry. A large number of witnesses appeared, and forcefully pointed out to the Committee that the Government must establish a firm mineral policy that will encourage domestic production, if the western mining industry is to survive.

A major point presented was the urgency of immediate action by Congress to protect the domestic lead-zinc industry. The Committee was told that dumping of foreign metals had been the direct cause of the present low market prices for lead and zinc, which closed down many domestic mines and smelters. Mining witnesses supported the principle of a sliding scale import tax and urged the Committee to recommend passage of the Simpson Bill, described above.

The witnesses told the Committee that all domestically produced metals should be protected from low foreign wage scales by a realistic tariff policy. They also stated that the industry has been throttled by the tax burden of the past ten years and asked for some form of relief as soon as possible. They asked that the stockpile be administered with a view to strengthening the domestic mining industry, and said that the extension of Government purchase programs for strategic minerals should be the first step in this direction.

The House Small Business Committee is presently preparing its report on the hearings, which will be given to the various legislative committees for their consideration.

Seaway Prospects

Strong Administration support for United States participation in the construction of the St. Lawrence Seaway has strengthened the prospects for action by the 83rd Congress along the lines of the Wiley Bill. This calls for construction of the Seaway at the International Rapids, development of the hydro-electric power jointly by New York State and the Province of Ontario, and the financing of the project by a bond issue on a self-liquidating basis.

Meanwhile, a hearing examiner of the Federal Power Commission has recommended that the power development be turned over to New York State. An FPC decision favoring this move is expected shortly.

Make Scholastic Award

James Robert Stewart of Loyall, Ky., a senior in the University of Kentucky's College of Engineering, is winner of an Old Timers' Award,

given each year to outstanding seniors in mining engineering.

The award, a gold watch, was presented to Stewart at an Engineering Assembly program conducted April 16 on the University campus. Making the presentation was Defense Solid Fuels Administrator Charles W. Connor, who was principal speaker at the assembly.

New Anthracite Use

An important new non-fuel use for anthracite was revealed in an announcement by Anthracite Equipment Corp. that it will shortly begin production of AnthraAid, a carbonaceous filter aid.

AnthraAid is a talcum-like substance made from anthracite and will be used by industries engaged in the processing of chemicals, petroleum, food, beer, pharmaceutical products or in any operation in which suspended solids must be removed from liquids.

Frank W. Ernest, Jr., president of the Anthracite Equipment Corp., and of its parent, Anthracite Institute, said AnthraAid is now being produced in small quantities in the Institute laboratory at Wilkes-Barre, Pa., where it was developed by the research department, headed by Dr. R. C. Johnson, vice-president, Research.

"We believe we are just scratching the surface," Earnest said, "in finding non-fuel uses for anthracite. It is our hope that by continuing research other uses for anthracite in commercial and industrial manufacturing will be found. In line with the policy of the Board of Directors of Anthracite Institute, certain new non-fuel products such as AnthraAid will be produced and marketed by the Anthracite Equipment Corp. Then as wider consumer acceptance is developed, it is hoped that tonnages will reach proportions where several producing companies will enter the field."

Anthracite Institute organized the Anthracite Equipment Corp., a wholly owned subsidiary, for the production and sale of anthracite products in the non-fuel category. Net income from such enterprises will be used to support a program of further research.

Open New Office

Bear Creek Mining Co. has opened offices at 3336 Republic Ave., St. Louis Park, Minneapolis, Minn. C. H. Burgess, district geologist, reports that the office will direct mining and exploration activities in midwestern states from Canada to the Gulf of Mexico.

Coal Analyses Report Issued

Analyses of tipple and delivered samples of coal collected during the fiscal year 1951 are given in a Bureau of Mines report of investigations. A similar report covering fiscal years 1948 through 1950 was issued recently as a printed bulletin, for sale by the Superintendent of Documents, United States Government Printing Office, Washington 25, D. C. The 1951 report is mimeographed and may be obtained free from the Bureau of Mines.

The analyses used by the Government in awarding coal purchase contracts are used extensively by industry. The Bureau maintains an open file of analyses for purchasing agents in Washington.

The 1951 present report includes analysis of samples from mines in 19 states. They are: Alabama, Colorado, Illinois, Indiana, Iowa, Kansas, Kentucky (eastern and western), Missouri, Montana, New Mexico, Ohio, Oklahoma, Pennsylvania (anthracite and bituminous), Tennessee, Utah, Virginia, Washington, West Virginia, and Wyoming. All of the samples were taken either at the tipple or at the point of delivery.

A free copy of Report of Investigations 4934, "Analyses of Tipple and Delivered Samples of Coal (Collected During the Fiscal Year 1951)," can be obtained from the Bureau of Mines, Publications-Distribution Section, 4800 Forbes Street, Pittsburgh 13, Pa. It should be identified by number and title.

Electric Power's Future

Within the next 10 years and perhaps by 1958, coal-fueled electricity will take over many of the energy jobs now done by gas and oil, according to George A. Lamb, manager of business surveys of Pittsburgh Consolidation Coal Co.

These projected uses alone will require an electric power load equal to one-third of the total electricity used last year.

Speaking before the 46th Annual Convention of the Air Pollution Control Association, Lamb predicted that electric power will have the greatest opportunity for growth among the end-use energies. He estimated that the shifts in end-use energy will involve supplementing or replacing residential gas and oil applications with electricity that to generate would require over 50,000,000 tons of coal. For industrial uses, gas and oil would be supplemented or replaced by over 150 million tons of coal, most of which will be direct applications of coal and some will represent coal-fueled electric power.

The coal economist acknowledged that some authorities believe the rate of growth may not be as rapid as recently experienced. However, Lamb said past tendency has been to underestimate energy requirements. Moreover, if energy needs fail to hit the projected increases in six years, they certainly will mature within 10 years. "Even 10 years doesn't give us too much time to get ready."

Lake State Mining Cos., Also Raise Trees

(*Continued from page* 40)

30 years as its principal timber is hardwood, which is a prolific natural reproducer as long as fire is kept out.

Actually, planting is a low priority activity with Lake States foresters. Only abandoned farmland, or in areas of heavy burns (rare indeed, nowadays), are trees planted. The Copper Range Co. uses their Michigan Reforestator planting machine to good advantage in the spring and fall, planting 200,000 trees a year on cleared farmland adjacent to their forests. It is interesting to note that this figure is approximately 10 times the number of trees cut per year in their logging operations. Calumet and Hecla foresters, likewise using a Michigan Reforestator, have planted over half a million trees. Red pine is the favorite of foresters in this land of heavy snow and spring erosion.

Lake States mining companies can well be proud of their leadership in good forestry. Over half of Michigan's Tree Farm acreage is mining company land. With trees the crop and foresters the farmers, the "lode" of wood will produce forever.

Advances In Gravel Production

First commercial production in this country of river gravel by the heavy media separation process has been announced by Keystone Division of Dravo Corp., Pittsburgh.

Designed to improve the quality of river gravel for use as aggregate for concrete, the process removes objectionable particles of "soft" gravel, porous gravel and foreign materials. Prior to tests of the heavy media principle, mechanical methods of scrubbing and pulverizing were used for years, with high maintenance costs and only partial success.

To retain the flexibility of its floating sand and gravel plants, Dravo designed and constructed a separate hull to carry the necessary equipment for the new process. The plant is fed by a conveyor belt extending from the normal loading point on the dredge to a feed hopper at the top of the new plant. The finished gravel product is loaded onto barges moored alongside.

The plant was placed in operation in April, 1952, and operated during the 1952 season. While further tests will be conducted to verify results to date, considerable improvement in the quality of gravel has been noted.

An important feature of the process is that it permits dredging for gravel in areas previously considered worthless because of contamination by coal and other deleterious material.

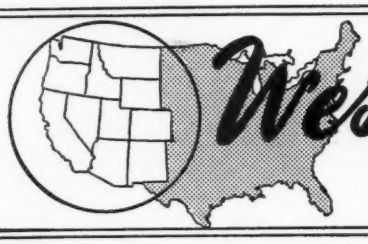
—BOOK REVIEW—

CRERAR METALS ABSTRACTS
Edited by A. Prochovnick, published by The John Crerar Library, Chicago 1, Ill. $50 for 12 monthly issues.

CRERAR Metals Abstracts is a service covering metals and alloys of current and potential interest to metallurgical researchers. It is designed to supplement older abstracting journals rather than as a substitute. With Volume I, No. 9, just received, coverage is expanded to cover more than 170 research and development papers on critical metals. Monthly reports now cover titanium, zirconium, hafnium, the rare earths, molybdenum, vanadium and papers of interest in the field of ferrous alloys.

CMA was established in August 1952 to bring current scientific papers on critical metals to the attention of industrial and governmental laboratories. It achieves its objectives of timeliness and completeness and a detailed index and cross reference aid in quick location of items of special interest to the reader.

This service also offers comprehensive, informative abstracts of research articles listed to help research workers keep abreast of developments.



Western States

Drilling Contracts Made

Sprague & Henwood, Inc. recently was awarded several large contracts for diamond core drilling exploration for uranium ore in the Colorado Plateau Area. The contracts total approximately 270,000 ft. Since 1949 this company has drilled hundreds of thousands of feet in this general area for private mining companies as well as for several governmental agencies.

Main office and manufacturing facilities of Sprague & Henwood, Inc. are located in Scranton, Pa., but due to the heavy volume of exploration work in the western mining field the company is planning to open a new office in Grand Junction, Colo. This new addition will be known as the Western Branch.

Make Scholarship Award

Whitman Symmes, Jr., University of Idaho law student from Kellogg, Idaho, has been awarded $250 from the Hecla-Bunker Hill scholarship fund, according to Dean H. E. Lattig, director of student affairs at the University of Idaho.

Reorganize Consulting Firm

Reorganization of H. W. Gould & Co., Mining and Metallurgical Engineers, San Francisco, Calif., was announced recently. This company has been engaged in general mining practice for 30 years in the western United States, Central and South America. The late H. W. Gould, its founder, was a leading figure in the quicksilver industry and for many years, the company's energies were devoted to quicksilver mining. Among the mines operated by the company were the New Idria, New Idria Alaska, Klau, Oat Hill, Mt. Tobin, Wild Horse and others. Design, installation and operation of the Gould Rotary Furnace was also one of the more important functions of the organization.

In more recent years, interest has broadened to include gold, base metals and fluorspar. Last year, Kaiser Aluminum & Chemical Co. purchased from H. W. Gould & Co., the Baxter Mine, east of Fallon, Nev., as a source of fluorspar.

Malcom B. Gould has purchased control of H. W. Gould & Co. and now heads the organization, along with Klau Mine, Inc., a California corporation. Bruce A. Gould, president of the company since 1950, has retired from the business.

Future plans include an intensive exploration program, with a view to developing and operating properties in California and the bordering states, directed toward the production of both metallic and non-metallic ores.

New AEC Plant

The new chemical processing plant at the Atomic Energy Commission's National Reactor Testing Station, designed to recover fissionable material from used reactor fuel elements, has begun operation, L. E. Johnston, manager of the AEC's Idaho Operations Office, announced recently. The plant is located at Idaho Falls, Idaho.

The chemical processing plant, operated by the American Cyanamid Co., New York, incorporates a number of new design concepts expected to produce data important to the economics of reactor utilization. It is designed for direct maintenance. Because of the intense radiation from fission products, chemical processing plants previously built have had costly provisions for replacements of defective units by remote control mechanisms. Although operations in the new plant must be carried on within thick shielding walls, the plant is expected to demonstrate the feasibility of decontaminating the individual cells in which the chemical processing is carried out, to allow workers to enter and do maintainence work.

Fly Mercury Ore Out

The United Mercury Mines Co., which operates mines in the Yellow Pine District of Valley County, Idaho, is flying mercury from its property to Boise. The shutdown of the Stibnite mine by Bradley Mining Co. forced the company to resort to this means of transport. Thus far little difficulty has been encountered and more than 150 flasks of mercury have been flown out.

Lignite Gasification Report

A two-year progress report covering early research at the Bureau of Mines gasification pilot plant at Grand Forks, N. D., to determine the best type of retort equipment to use and to develop the technology of making lignite gas—potential source of synthetic liquid fuels, synthetic ammonia and hydrogen—has been released by the Department of the Interior.

The report covers five runs, totaling 1996 hours, made in the commercial-scale pilot plant in December, 1946, and during 1947 and 1948. Gas yields ranged from 36,000 to 54,000 cu ft per ton of natural lignite used.

As prior attempts to gasify American lignite with steam had met with little success, new equipment for continuous gasification was developed by the Bureau. The big problem was to obtain a metallic material for the externally-heated retort tube that could stand up under high temperatures used in gasification.

Dakota Star lignite from Hazen, Mercer County, N. D., rescreened to eliminate oversized and undersized particles, was used in the tests. The process, however, is not restricted to any one lignite. No major changes in plant equipment were made for the experiments.

A free copy of Report of Investigations 4940, "Gasification of Lignite in a Commercial Scale Pilot Plant—Progress Report for 1947-48," may be obtained from the Bureau of Mines, Publications Distribution Section, 4800 Forbes Street, Pittsburgh 13, Pa.

Build Research Center

A research center is being constructed on the campus of the University of Utah by the Kennecott Copper Corp. Now 50 percent complete, the structure will be ready for occupancy late in 1953. The new center will employ approximately 50 scientists, technicians and laboratory assistants. Opportunities for work will be extended students studying metallurgy and related sciences at the University.

All of Kennecott's operations in western states will be served by the new center, which will concentrate on investigations into mining, smelting and refining. Ores and minerals from many parts of the world will be examined, however, in connection with the company's expanded search for new minerals deposits.

Uranium in Nevada

A discovery of uranium ore has been made 40 miles west of Fallon, Nev. Geologists of the Atomic Energy Commission have examined the property and confirmed that uranium ore of commercial grade is present. Samples tested at the Salt Lake City station of the U. S. Bureau of Mines contained two types of uranium ore, both of commercial grade.

The deposit outcrops at three points along a length of approximately 1500 ft. Ore is similar to that currently being mined in Colorado. Owners of the claim have been prompted by Commission geologists to trench across the vein and remove overburden to determine if the ore body is continuous. Officials of the Salt Lake City Exploration Branch have advised that the property and adjacent areas will be examined by a field team.

The uranium ore deposit was found in an area adjacent to the Rawhide district, notable producer of gold, silver and tungsten. Discoverers of the deposit, equipped with fluorescent lamps and Geiger counters, were exploring the region for tungsten and other minerals when they were attracted to the uranium deposit by its yellow outcrops.

Royal Drift Mine

The Royal Drift Mine in Butte County, Calif., is about to be put into production. The property, which closed 23 years ago, has been rehabilitated and reequipped. The Best tunnel, originally driven in 1879 and abandoned because of heavy water flow, has been unwatered and the flow diverted. Extension of another tunnel also is planned to reach an area where gold ore is expected to be found.

Baltimore Camas Grows

Baltimore Camas Mines, Inc., plans to operate at full capacity its new 100-ton mill at Ely, Nev., this spring. The mill was started up in December and now is operating on ore produced from company mines near Ely. The company is operating the property formerly owned by the Cherry Creek Mining Co. and will continue to operate Cherry Creek's 30-ton mill. Cherry Creek has several large properties, (including the Ticup, Chance, and Filmore) while Baltimore Camas is mining ore from its Shaffer, Coolie, and Hilltop holders.

Millisecond Delay Blasting

(*Continued from page* 53)

of a multiple-row bench round could only break upward toward the surface, the only free face available. Essentially the same situation prevails in a V-cut heading round in which vertical rows of horizontal holes are designed to slab toward a center cut. If too brief a delay is allowed between successive rows, the rock can break only toward the face of the heading and go shooting down the drift like shotgun pellets. Excessive throw has been reported at other mines in experiments with millisecond-delay heading and raise rounds[3] because the rounds broke as multiple-hole crater shots throwing toward the face rather than sideways toward a cut.

There are thus two factors to consider when a multiple-row bench round or a heading round is blasted in which slabbing rows break toward a center cut. The first is the delay time between adjacent holes within a single row so as to produce maximum breakage and fragmentation with the least amount of explosive. The second is the delay time between the firing of successive rows. Whether there is an optimum delay time for rows is not known but probably any delay greater than the minimum required to unburden each row would be effective. However, there is a practical reason for using the minimum delay, namely, that variation of the actual firing time of commercial millisecond detonators increases as the delay time increases. Thus the probability of attaining optimum, almost simultaneous, firing decreases when the longer-delay millisecond detonators are used.

Test Concept

Three final experimental heading rounds were blasted to test the validity of this concept of millisecond blasting. In the first two rounds, a delay period of 100 m.s. was allowed between the cut holes and the first reliever row as well as between the other slabbing rows. All cut holes of the first round were detonated with 25-m.s. caps, and a few large boulders from the cut were found at the toe of the muck pile. The fragmentation of the remainder of the round was excellent. All cut holes of the second round were detonated with 100-m.s. caps, and no large boulders were found in the pile. The muck piles from these rounds were 90 ft long—much shorter than those from previous millisecond rounds but 20 ft longer than those from standard delay rounds.

[3] Agnew, Wing G., Blasting Raise Rounds With Millisecond Delays; Mining Cong. Jour., April, 1949.

Agnew, Wing G., More About Blasting Raise Rounds: Mining Cong. Jour., October, 1949.

The final test round was charged with 615 lb of 45-percent semigelatin dynamite, and cut holes were detonated with 0- and 50-m.s. delays to insure adequate fragmentation of the cut. A delay of 150-m.s. was allowed between the cut holes and the first reliever row and 100-m.s. between subsequent rows. The rib rows were detonated with No. 1 standard delays because 600-m.s. delay detonators were not available. This round broke perfectly. The throw was 70 ft—no more than that from standard delay rounds; the full depth of round was pulled; and considerably less dynamite was used. Probably results equally as good could be obtained with even less explosive. However, additional experimentation would be required to determine the minimum amount of explosive necessary to break heading rounds with millisecond delays.

The final test round proved that excessive throw will not occur with millisecond rounds when a long enough time is allowed between the firing of successive rows. Advantage can then be taken of the almost simultaneous detonations of millisecond delays in individual holes within each row to reduce the amount of explosive necessary to break a round and improve the fragmentation.

AEC Opens Arizona Office

Search for and exploration of uranium ores in Arizona has drawn an assist from the Atomic Energy Commission with the opening in Phoenix of a statewide sub-office of the AEC's Salt Lake City Exploration Branch. This office is similar to other sub-offices located in areas of uranium exploration activity such as Grants, N. M., Hot Springs, S. D., Butte, Mont., and Richfield, Utah. Field inspections are to be made of all known uranium finds in the state and technical help will be given prospectors seeking uranium-bearing ores.

In charge of the new office is A. J. Rambosek, who was the first AEC engineer to report on the Mohave County ores north of Kingman, Ariz. Technical aid will be available not only in the search for uranium but for other radiactive minerals as well.

Set Production Record

An all-time record was set during March for the production and shipment of iron and steel products at the fully-integrated Pueblo, Colo., plant of The Colorado Fuel and Iron Corp.

A heavy program of expansion and modernization of steel-making facilities at Pueblo, accomplished during the past year, contributed greatly to the peak production attained in March, according to A. F. Franz, president of CF&I.

New open hearth equipment was installed, and a new coal washery added to the Pueblo plant, as well as many new pieces of handling and transportation equipment, during recent periods. A complex belt conveyor system and a new ore and limestone crushing unit have also aided materially in the increased production of pig iron at Pueblo.

Radioactivity in Wyoming

Sixty-three airborne radioactivity anomalies have been located in the Pumpkin Buttes region of Wyoming. The anomalies represent areas of unusually high radioactivity as observed from the air, and may or may not indicate the presence of uranium on the ground.

A photo-mosaic map has been compiled showing the locations of the radioactivity detected during an airborne survey of 800 sq miles in Johnson and Campbell Counties. The Wyoming surveys were part of a program of airborne reconnaissance for uranium-bearing ore bodies conducted by the Geological Survey for the Atomic Energy Commission.

Copies of the map will be made available for reproduction by those who are interested, at Geological Survey offices in Casper and Laramie, Wyo.

Crescent Mine Exploration

A contract for exploration of the Crescent mine near Kellogg, Idaho, has been obtained from Defense Minerals Exploration Administration by Bunker Hill & Sullivan Mining & Concentrating Co. The Crescent shaft, now down 1200 ft, will be deepened 2000 ft and lateral explorations made from the 3200-ft level. DMEA and the company will share equally the expense of the program, which is for the development of lead, zinc, copper and silver ores.

Crescent mine has yielded substantial amounts of these minerals in the past. It is downstream on Big Creek from the Sunshine mine, the nation's largest silver producer. The Crescent was shut down early in World War II, and was not reopened until rehabilitation began last fall.

Pima Deepens Shaft

The Pima Mining Co., operating a copper property in the Mineral Hill mining district, south of Tucson, Ariz., is deepening its two-compartment shaft to the 600 level. Complete exploration of the 500 and 600 levels is planned. The shaft has already attained a depth of over 550 ft.

Development of the Pima mine was started January 1, 1952, with the sinking of a 425-ft two-compartment shaft. Stations were cut at the 300 and 400 levels, and development of those levels was carried on throughout the last six months of the year. All shipping-grade ore mined during development was sent to the American Smelting and Refining Co.'s El Paso Smelter.

Prior to shaft sinking, the Pima company had conducted extensive geophysical and diamond drilling exploration of its holdings.

Kennecott Opens Ore Tunnel

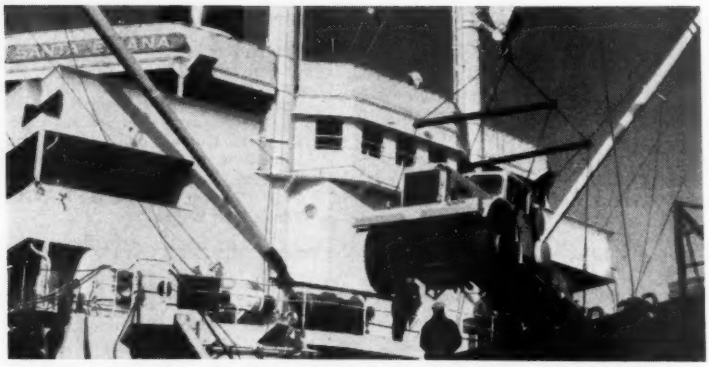
Ore trains started through a new tunnel on the 5840-ft level at the Bingham copper pit near Salt Lake City, Utah, on March 30. Officials of the Kennecott Copper Corp.'s Utah Copper Div., said the 7042-ft long tunnel took two years to complete. On the mine side it opens on the lowest level of the copper pit, and the lower portal of the 1⅛ mi haulage tunnel is situated in lower Bingham. Contractor for the job was the Utah Construction Co.

The new tunnel is the second ore haulage bore to be completed at the pit. The first haulage tunnel at pit elevation, 6040 ft, also took two years to build and was completed in December, 1945. It was placed in use in January, 1946.

These two haulage ways handle the movement of pit ore and the return of the empty cars from Magna and Arthur mills to pit shovels for reloading.

New Mill Operating

Milling operations at the new plant of the Gibbonsville Mining & Exploration Co., west of Kellogg, Idaho, have been started. The plant will mill tailings from the south fork of the Coeur d'Alene River. It is hoped that 200 tpd can be run through the mill at first with a gradual build up to a capacity of 400 tpd.



Delivery of a fleet of trucks to the Utah Construction Co. of San Francisco, for use in hauling iron ore from the Utah Construction Co.'s Marcona project in Peru to shipside on the Peruvian Coast, has been completed by Kenworth Motor Truck Corp. of Seattle, Wash. Miles & Sons Trucking Service will operate this fleet to move ore 17 mi from the Marcona mines to San Juan, Peru, for shipside loading. The Marcona project, located 300 mi south of Lima, is being mined by the Utah Construction Co. on a contract with the Peruvian Government.

Uranium Mining in Colorado

The Colorado State Bureau of Mines has estimated that uranium mining and processing operations were worth $50,000,000 to Colorado during 1952. W. E. Scott, Jr., Commissioner of Mines, pointed out that actual uranium production figures are secret. He said that the $50,000,000 figure is not actual production, but is an estimate of the amount of wealth produced through uranium mining and processing with vanadium by-products.

Scott said uranium mining and refining is rapidly becoming the state's laregst mineral industry. In 1952, according to estimate, it ranked second only to oil.

URGENT. Need a two drum shaft hoist, 300 hp or larger. Also, a 200 hp or larger single drum hoist. Box No. 808.

New Tungsten Unit

Trojan Mining & Milling Co. is operating its new tungsten concentrator at Toy, 15 miles west of Lovelock, Nev. The plant has a daily capacity of 100 tons. The company is mining scheelite from deposits in the near-by Ragged Top Mountains and expects to mill 50 tons of custom ore per day besides its own product.

Complete Shaft

Moreno Cripple Creek Corp. has announced the completion of the second incline shaft of its Snowflake and Sunflower claims at Moab, Utah. Ray A. Bennett, Denver, president of the firm, said that some of the ore encountered in the sinking had been delivered to the Atomic Energy Commission purchasing station at Monticello, Utah. Ore bins and chutes are being installed at both inclines.

Manufacturers Forum

Automatic Safety

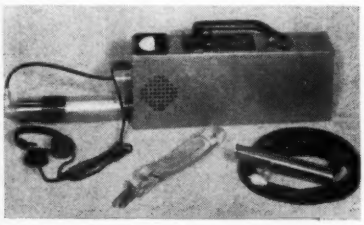
Development of a new instrument that will continuously sample the atmosphere of coal mines for methane gas, has just been announced by Mine Safety Appliances Co.

The instrument takes samples of return air and automatically analyzes them to detect presence of methane gas. It can sound an alarm, visible and audible, when a predetermined concentration of methane is present in the sample.

The new detecting instrument can be arranged to sample atmosphere from one or several locations. It also may be equipped with a device that will provide a continuous written record of methane concentration.

New Geiger Counter

The Radiac Co., Inc., 489 Fifth Avenue, New York 17, presents the newly engineered Model 105-D Prospecto-



scope for radioactive mineral prospecting. The Model 105-D can be used for prospecting from low flying aircraft, from a moving vehicle or on foot, and also for probing drill holes to depths of 50 ft. Weight of the complete instrument is 14 lb.

Crusher Protection

A new metal detector especially engineered to meet the needs of quarries, coal mines, and other mining type industries for the protection of crushing machinery has been developed by the Industrial Equipment Section of the RCA Victor Div., Radio Corp. of America.

The new equipment would normally be installed between the primary and secondary crushing operations. Inspection coils are adjusted so that the equipment will detect any pieces of tramp metal, magnetic or non-magnetic, large enough to damage the crushing machinery, but will not stop operations for small unobjectionable metal objects.

The detector will give satisfactory performance at conveyor speeds of up to 600 fpm, the company stated. It operates on 115-v, 50-60 cycles, and consumes approximately 70 watts.

Improve Timber Handling

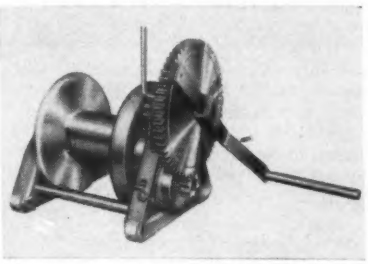
Receiving much attention among pulpwood operators, and other industries with similar handling problems, is the new Hyster Pulpwood Loader, manufactured by the Hyster Co.

A special tool designed for quick, efficient handling of small logs, the Pulpwood Loader consists of the well-known Hyster Model 150 Lift Truck and a special boom attachment. With a 13,300-lb loading capacity the Pulpwood Loader may be the answer to timber handling problems about your mine. The machine has a short turning radius, high degree of maneuverability and an ingenious "split sling" that eliminates hazards in releasing load.

Information and specifications are available from Hyster Co., Portland, Ore., or any Hyster dealer.

Portable Winch

A mechanical hand-winch with low gear load capacities up to 10,000 lb, designed for optional use with a one-in. electric Skildrill, has been an-



nounced by Stampco Products Co., Minneapolis, Minn.

Load capacity at low gear is 10,000 lb at 27:1 reduction; capacity at high gear is 1900 at 4.5:1 reduction. Provision is made in design for the attachment of a power source for electric operation of the Handiwinch, enabling the operator to handle loads up to 1000 lb at ten fpm.

For price information and literature, refer to Department KP, St. Anthony Machine Products Co., 2424 East Franklin Ave., Minneapolis, Minn.

Dart Shows 60-Ton Truck

Because the new Dart Model 600, 60-ton truck (and its smaller—20 to 40-ton sister trucks) is strictly an off-the-highway job, its construction is entirely different from even the largest highway trucks. For instance, its two Buda Super Diesel engines, totaling 700 hp, are mounted amidship of the truck's underbelly, one on either side.

Dart's new 60-tonner will be put to work at the Bagdad Copper Mines in Bagdad, Ariz., where its production and performance will be recorded to guide engineers. Five additional Dart 60-ton trucks will be delivered to Bagdad later this year.

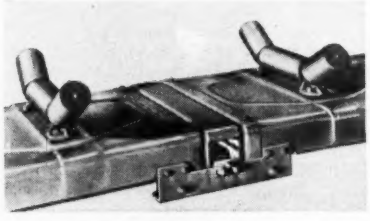
Biggest Magnetic Pulley

The cute gal is perched on top of what is believed to be the biggest non-electric Alnico magnetic pulley ever built. Made by the Dings Magnetic

Separator Co., Milwaukee, Wis., this 2825-lb, 36-in. by 36-in. Dings Perma-Pulley is used at a Missouri lead company to remove tramp iron from minus three-in. lead zinc on a belt moving 300 fpm with a capacity of 840 tph.

Introduces Conveyor Idlers

Hambro Machinery Division, 17 East 54 Street, New York 22, N. Y., announces the introduction of the M & C Troughing Idlers & Return Rollers. These new Trough Belt



Roadway Conveyors are made of close-grained cast iron for greater resistance to abrasion and corrosion. The closed ends keep out dirt. Specially made "SKF" ball bearings and method of mounting reduces friction to a minimum. The bearings are dirt proof—closed upper end and greased labyrinth prevent grit, dust and dirt from penetrating. The return idlers are made of seamless steel with smooth finish.

Complete information is available by writing to the company.

Improved Auger Developed

The Central Mine Equipment Co. of St. Louis, Mo., manufacturers of coal mine drilling tools, have developed a new team of roofbolting augers and drill rods under the trade name of Coalmaster roofbolter augers and drill rods.

These new augers and drill rods are designed especially for wear and break resistance in either wet or dry drilling.

Standard shanks non-weld type are available for either the Baker-Fletcher or Chicago Pneumatic drills. (Joy, Jeffreys, and other shank designs can also be furnished). The sockets will accommodate any bit, such as Firthite, Kennametal, Sulmet, Carboloy and others.

For further information write Central Mine Equipment Co., 6200 N. Broadway, St. Louis 15, Mo.

Westinghouse Air Brake Purchases LeTourneau, Inc.

After extensive negotiations, a general agreement was reached April 27 covering the purchase by Westinghouse Air Brake Co. of the earth-moving, tractor and related business of R. G. LeTourneau, Inc., and its international sales and distribution organization and its Peoria, Ill., and Toccoa, Ga., plants, R. G. LeTourneau, president of LeTourneau and Edward O. Boshell, president of Westinghouse Air Brake, announced.

The LeTourneau company will retain and continue to operate the Vicksburg, Miss., and Longview, Tex., plants and manufacture special products for the U. S. Government, land clearing equipment, cranes and other products not related to earth-moving. However, LeTourneau will continue his development and research work in this field for the new owners.

Retip Auger Drills

Expanded line of coal mining products currently offered to the mining industry by Carboloy Department of General Electric Co. in Detroit, now includes standard blanks for retipping auger drills.

According to the department, the blanks, available from stock in standard coal mining grades, are for auger drills designated as AD-28, 30, 32-2, 36, 40 and 44. Users now can obtain the blanks from local Carboloy mining distributors.

Fight Fires

American-LaFrance-Foamite Corp. has introduced a one-man fire-fighting wheeled engine for extinguishing large scale Class B and C fires. It is a dry chemical, wheeled engine, with a 150-lb capacity of dry chemical compound. Burning gasoline, paints, oils, greases, etc. are classified as Class B fires. Class C fires are those in which electrical equipment burns.

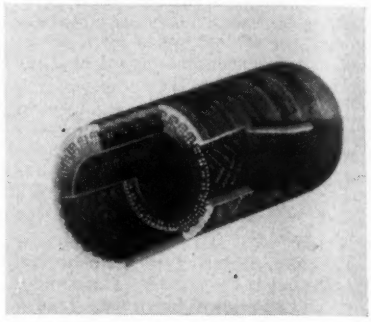
Better Battery Service

Twenty percent more capacity in the same space is the sensational advantage claimed for the new line of T-H Exide Ironclad batteries just announced by the Electric Storage Battery Co.

The new battery, which is essentially the famous Exide Ironclad using the exclusive slotted tube positive plate, with the long-life qualities for which Ironclads are known, now incorporates new materials and structural changes to give increased capacity. Complete information can be had from the company at 42 So. 15th St., Philadelphia 2, Pa.

Heavy-Duty Air Hose

A new, heavy-duty air hose especially developed for rugged uses in mines, quarries, construction jobs, steel mills and shipyards has been announced by Quaker Rubber Corp.,



Division of H. K. Porter Co., Inc., Philadelphia, Pa.

Horizontally braided rayon cable cord reinforcement allows this new Qua-Flex brand air hose to withstand working pressures as high as 450 psi, yet remain flexible at temperatures as low as —40°F, according to the manufacturers. This type construction eliminates "snaking" at high pressures.

Find Those Flaws

Accurate, on-the-spot inspection for metal soundness can now be made on any metal at any location, no matter how remote, through the medium of a new, all metal, portable Turco Dy-Chek flaw location kit. The light, compact metal kit can easily be carried in one hand.

To use the Dye Penetrant is brushed onto the surface being inspected. After being allowed to dwell long enough to enter any defects that may extend to the surface of the metal, the excess is removed. The Developer is then "fogged" along the surface being inspected until a thin, even white coating has been applied. The Developer dries almost instantaneously, pulling the hidden red penetrant to the surface at locations where flaws exist. Cracks are indicated as brilliant red lines, while red dots indicate porosity. Depth of defects is indicated by richness and speed of bleed-back.

Complete information may be obtained from Turco Products, Inc., 6135 South Central Ave., Los Angeles 1, Calif.

Low-Cost Hoist Marketed

A new model Zip-Lift Electric Hoist with rope control to sell for $199.50 is announced by the Harnischfeger Corp., Milwaukee, Wis.

P&H stresses the fact that the new Zip-Lift is guaranteed to operate continuously during intermittent usage for a period 25 percent longer than the rated time limit. The new hoist is also designed with a weight-overload safety factor of five times the rated capacity.

It comes in two models with lifting capacities of 500 and 1000 lb. Hoisting rates are 25 and 13 fpm and both models are available with 12-ft and 18-ft lift.

For Hoisting Advantages

A new frequency-modulated carrier communication system for mine hoists has been announced by Mine Safety Appliances Co.

Called the HoistPhone, MSA's new communication system is designed to maintain two-way conversation between the hoisting engineer and the hoisting cage. The system operates with the cage at any level, as well as in motion.

Full details and illustrations are available from the company at Braddock, Thomas, and Meade Streets, Pittsburgh 8, Pa. Bulletin Number 1601-2 will be sent without cost.

Speed Concrete Drilling

A Water Feed Attachment for use with special Tilden Rotary Koncrete Kore Drills is the newest development

of the Tilden Tool Manufacturing Co. of San Clemente, Calif.

Tilden reports that the tool increases drilling speeds up to 300 per cent over that possible with ordinary concrete drills, and that water lubrication also prolongs the effective cutting life of the drill.

Scale Roof 100 ft Up

A new unit designed to give a man a 100-ft reach has been built by Mobile Aerial Towers, Inc., Fort Wayne, Ind.

The rig is entirely controllable by one man from the operator's platform on the point of the 100-ft boom. He can elevate or drop the upper or lower boom and swing the turntable 280° all at the same time with the "feather-touch" lever at his hand.

The Hug chassis on the initial model was supplied by its purchaser, a limestone mining company along the Mississippi River. They will use the mobile tower inside a mine to inspect and scale the 90-ft ceiling.

—*Announcements*—

Robert H. Pearson, who has been associated with **Gardner-Denver Co.** for 37 years, retired as a vice president of the company in May, and moved to Denver to assume management of Air Rentals, Inc., a newly formed organization which will distribute Gardner-Denver equipment and several allied lines of equipment and supplies for mining and construction.

Pearson joined the Denver Rock Drill Co. in Denver, Colo., in 1916, and became associated with the Gardner-Denver organization when the Denver firm merged with the Gardner Governor Co. of Quincy, Ill., in 1927. He left Denver in 1928 for Knoxville, Tenn., where he managed the Knoxville branch office of Gardner-Denver until his transfer to the home office in 1930. He was elected vice-president in 1934, and served as sales manager for construction and oil field equipment up to the time of his retirement.

M. M. Schratz, controller of **Aluminum Co. of America** since 1947, has been elected to a newly created vice-presidency, Alcoa's Board of Directors has announced.

Ohio Brass Co. announced two changes in its territorial organization. **W. R. Cress** has been transferred to the Chicago area as a district manager; **V. L. Crabb** has been named district manager in the Cincinnati area.

Cress takes over the territory formerly handled by M. R. Gowing, who resigned June 1, to join the J. S. G. Electric Co.

Appointment, effective May 1, of **William Brill** as director of engineering for **The Colorado Fuel and Iron Corp.** was announced by Jay J. Martin, vice-president of operations for CF&I.

As director of engineering for the corporation, Brill will advise and consult with engineering staffs located in various CF&I properties throughout the nation.

CATALOGS AND BULLETINS

ATLAS MORTAR CEMENT. *Universal Atlas Cement Co., 100 Park Ave., New York 17, N. Y.* This booklet deals in detail with those characteristics deemed desirable in a good masonry cement by architects, engineers, builders, masonry contractors and masons. It can be had by addressing a request to Universal Atlas Cement Co. at the above address.

CABLE REEL SHUTTLE CARS. *Goodman Manufacturing Co., Halsted St. and 48th Place, Chicago 9, Ill.* Catalog 532 describes the Goodman cable reel shuttle cars, 42 in. and 48 in. basic heights with elevating discharge, 42 in. with fixed height discharge.

CENTRIFUGAL PUMPS. *Allis-Chalmers Manufacturing Co., Milwaukee 1, Wis.* Allis-Chalmers single-stage, double-suction centrifugal pumps are described in this Bulletin 08B6146B. In addition to providing data on the pumps' construction features, the bulletin explains how to figure pumping head, carries tables of available sizes, approximate dimensions and head capacities, and tabulates friction loss for water per 100 ft of pipe. Write the company at 972 S. 70th St., Milwaukee, Wis.

CONVEYOR BELTS. *The B. F. Goodrich Co., Akron, Ohio.* This 16-page catalog describes Goodrich's line of 12 Caricoal conveyor belts. A three-page section of engineering data features a four-step procedure for the proper selection of coal belts. Other engineering information is included and four pages are devoted to care and maintenance and installation tips which help coal mine operators get longer life from their belts.

FORCED FEED JAW CRUSHERS. *Denver Equipment Co., 1400 17th St., Denver, Colo.* Bulletin No. C12-B12 covers construction and operation of two types of Denver Jaw Crushers. It gives operation, specifications, capacities and dimensions for the two crushers.

HERRINGBONE GEAR DRIVES. *Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill.* This 36-page book offers detailed information about Link-Belt single, double and triple reduction enclosed herringbone gear drives. Complete instructions for correct selection are provided, including new overhung load tables and a table listing load classes for 170 types of machines.

KENNAMETAL MINING TOOLS. *Kennametal Inc., Mining Tool Division, Bedford, Pa.* Catalog M-7 describes Kennametal's line of cutter bits, roof bits, drill bits, rock bits, open-pit bits and other mine drilling accessories. Accompanying the catalog is a cost book on Kennametal mining tools and a price list of these tools.

PREVENTIVE MAINTENANCE. *Euclid Road Machinery Co., Cleveland 17, Ohio.* Describes a simple and easily followed maintenance program developed for Euclid earth moving equipment. It includes a detailed outline of all points that should be checked at 100, 500, 1000, 2000 and 4000 hours of operation. Copies available from the company.

TUBE MILLS. *Hardinge Co., Inc., York, Pa.* Bulletin No. 18-B is a 12-page catalog describing Hardinge's line of tube mills for grinding and pulverizing. Discussed are the application, construction and specifications for the Hardinge Pebble Tube Mill and the Hardinge Ball Tube Mill.

Index to Advertisers

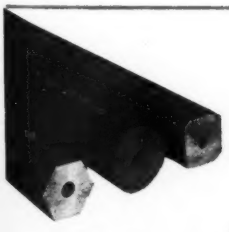
THE MINE FOREMAN

CRUCIBLE HOLLOW DRILL ROD

teamwork in specialties

In the mining industry the foreman is a mighty important guy. He is responsible for the successful performance of mining operations underground—for the supervision of mine workers and for keeping them properly equipped with the tools and supplies needed to get out their round. That's why in so many drilling operations you'll find that the mine foreman prefers Crucible Hollow Drill Rods.

He knows that with rising costs of labor and new equipment he must get the best service he can out of his rock drills . . . with minimum breakage and bit loss. And many a mine foreman has seen first hand that Crucible Hollow Drill Rods do just this . . . that they provide the lowest cost per foot per hole in hard rock drilling. For best drilling performance, use Crucible Hollow Drill Rods.



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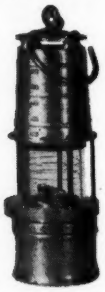
Increase Tonnage—Better Safety *with* M·S·A Products

Featured at the COAL SHOW

EDISON R-4 ELECTRIC CAP LAMP

The brilliant, dependable, unfailing light of the Edison R-4 Lamp gives miners the better light they must have to work today's mechanized equipment at its greatest capacity, safely. We'll be glad to demonstrate its value.



M.S.A.—WOLF JUNIOR FLAME SAFETY LAMP

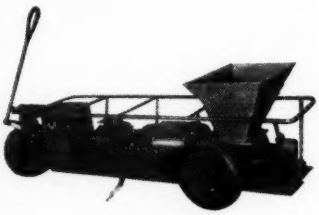
Your inspection job will be a lot easier with this small, light-weight model. Its dependable, steady flame is guarded from drafts by better ventilation and openings. Easy-to-read standard size graduated chimney. 70% of parts interchangeable with standard model.

Let us help you apply their advantages to your current production-safety program

Perhaps you are interested in some of these products now, after seeing them at the Coal Show, and would like more information. Your nearest M.S.A. representative is ready to talk over your ideas, and demonstrate where our products can help better your production picture . . . increase overall safety.

M.S.A. MINEPHONE

Coordinate haulage with demand; save time; avoid wear and tear on your equipment; keep trips moving; aid safety by dispatching orders instantly and simultaneously to all motormen, who can reply or communicate with each other *while trips are in motion.*



M.S.A. BANTAM ROCK DUST DISTRIBUTOR

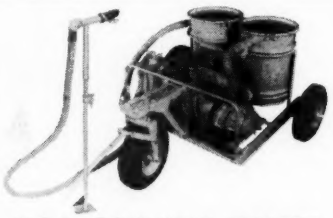
For fast, economical distribution of rock dust right up to the working face, this easily transported rock dust distributor meets your every need. Other electric or compressed air operated models are also available.

M.S.A. DUSTFOE #55 RESPIRATOR

Light weight, compact and comfortable breathing protection that's tops in worker acceptance. Streamlined design and comfortable fit allow wearer to concentrate on the job. Effective filtering action combats dust hazards. U.S. Bureau of Mines Approved.

M.S.A. METHANE RECORDER

This dependable instrument is a valuable guide for regulating the volume of air required to maintain proper and economical ventilation standards. It provides a continuous record of methane concentrations in return air. You'll be interested to know how it may effect economies in your ventilation system.



M.S.A. BOLT-HOLE CLEANER

The practical answer to your dust problems created by rotary or percussion drilling. U. S. Bureau of Mines Approved. Let us show you the facts on this efficient aid to dry drilling for roof-bolting.

M.S.A. SELF-RESCUER

Provides instant breathing protection for your miners in fire or explosion emergencies. Miners can carry the Self-Rescuer with them, or it can be stored in convenient steel cases anywhere in the mine. Safeguards user while traveling through carbon monoxide contaminated air to fresh air. U.S. Bureau of Mines Approved.

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